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STAR

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*

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82 DOCUMENTATION AND INFORMATION SCIENCE 2432
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For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2434
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 2434

89 ASTRONOMY 2434
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2439
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2440
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 2441
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2455
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 2456

Note: N.A. means that no abstracts were assigned to this category for this issue.

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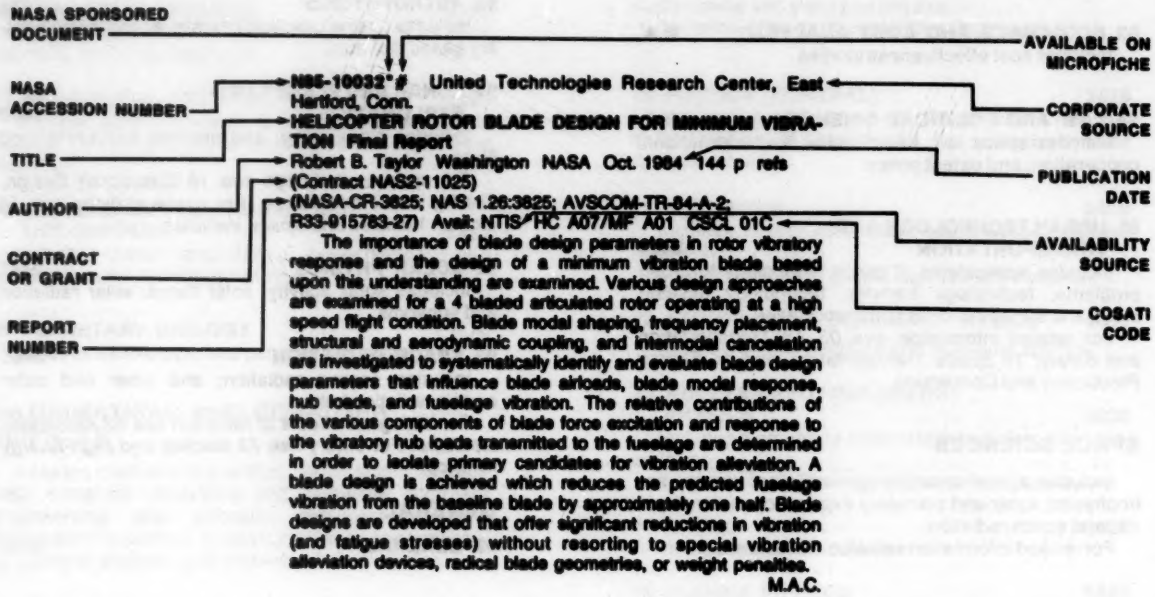
TYPICAL CITATION AND ABSTRACT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N85-10032*# United Technologies Research Center, East Hartford, Conn.
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 14 / JULY 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-23682* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES
Apr. 1985 121 p
(NASA-SP-7037(188); NAS 1.21:7037(188)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 419 reports, articles and other documents introduced into the NASA scientific and technical information system in March 1985. M.G.

N85-23683*# National Aeronautics and Space Administration, Washington, D. C.
MODEL RESEARCH: THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, 1915-1958, VOLUME 1
Alex Roland 1984 432 p refs 2 Vol.
(NASA-SP-4103-Vol-1; NAS 1.21:4103-Vol-1) Avail: NTIS HC A19/MF A01; also available from SOD HC $26.00 as set of 2 CSCL 01B

The National Advisory Committee for Aeronautics, the predecessor of NASA, was the premier aeronautical research organization in the United States. It conducted scientific study of the problems of flight with a view to their practical solution. This institutional history traces the birth and evolution of the NACA and analyzes such recurrent themes as the roles of science and engineering, the influence of politics on technology, the way in which the institution shapes technology and technology shapes the institution, the contributions of key individuals, the nature of the research process, and the relation between military and civilian aviation. Author

N85-23684*# National Aeronautics and Space Administration, Washington, D. C.
MODEL RESEARCH, THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, 1915-1958, VOLUME 2
Alex Roland 1985 414 p refs 2 Vol.
(NASA-SP-4103-Vol-2; NAS 1.21:4103-Vol-2) Avail: NTIS HC A18/MF A01; also available from SOD HC $26.00 as set of 2 CSCL 01B

Appendices providing comprehensive data on personnel, organization, funding, research programs, and publications of the National Advisory Committee for Aeronautics (NACA) are presented. Information concerning NACA-related legislation and research facilities is also included. M.G.

N85-23685*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUTURE DIRECTIONS IN AEROPROPULSION TECHNOLOGY
Neal T. Saunders and Arthur J. Glassman 6 Sep. 1985 39 p refs Proposed for presentation at 7th Intern. Symp. on Air Breathing Eng., Beijing, China, 2-6 Sep. 1985
(NASA-TM-87010; E-2553; NAS 1.15:87010) Avail: NTIS HC A03/MF A01 CSCL 01B

Future directions in aeropropulsion technology that have been identified in a series of studies recently sponsored by the U.S. Government are discussed. Advanced vehicle concepts that could become possible by the turn of the century are presented along with some of their projected capabilities. Key building-block propulsion technologies that will contribute to making these vehicle concepts a reality are discussed along with projections of their status by the year 2000. Some pertinent highlights of the NASA aeropropulsion program are included in the discussion. Author

N85-23686# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTICA SINICA, SELECTED ARTICLES
4 Oct. 1984 63 p refs Transl. into ENGLISH from Hangkong Xuebao (China), v. 4, no. 4, 1983 p 1-10; 11-19; 39-47; 101-104
(AD-A147304; FTD-ID(RS)T-1120-84) Avail: NTIS HC A04/MF A01 CSCL 20/4

The transonic small distribution (TSDH) equation to calculate the transonic flows over three-dimensional swept wings was used to consider the leading edge boundary conditions and leading edge velocity potential equation suitable for the blunt leading edge of wings. The expanded form of the Jameson scheme in the unequal stop length grid for the disretization of the TSDH equation into a set of finite difference equations was applied, afterwards a rarefied grid in the calculation space was arranged, a dense grid near the wing was arranged and alternate iteration of the rarefied and dense meshes was carried out to accelerate convergence and raise calculation precision. Calculations of the supercritical without shock wave and with shock wave conditions of the ONERA M6 wing show that there is good agreement between the TSDH solution and the FVP solution and wind tunnel tests. E.A.K.

N85-23687# Rolls-Royce Ltd., Derby (England).
FLEXIBLE MANUFACTURING SYSTEM FOR THE PRODUCTION OF AIRCRAFT PARTS
M. Weck, Y. Tuechelmann, K. Zenner, D. Zuehlke 13 Nov. 1984 16 p refs Transl. into ENGLISH from Ind. Anzeiger (West Germany), v. 10, no. 32, 20 Apr. 1979 p 42-46
(PNR-90237; Trans-16495/TLT-00913) Avail: NTIS HC A02/MF A01

A system for machining integral aircraft components is presented. It comprises control functions for numerical control machines and material flow, and a processing system for organizational data. Automatic data feedback from the production line, and prompt availability of data to the associated sectors of the firm contribute to shorter planning and decision times. The creation of subsystems which can operate independently means that they can be used as stages in a gradual expansion of a manufacturing system. Author (ESA)

N85-23688# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION

25 Mar. 1985 93 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-85-005) Avail: NTIS HC A05/MF A01

Topics in transportation in the U.S.S.R. are covered. Some subject areas are civil aviation, rail systems and maritime and river fleets. For individual titles, see N85-23689 through N85-23693.

N85-23689# Joint Publications Research Service, Arlington, Va.
MINISTER BUGAYEV ON CIVIL AVIATION IN 1984, PLANS FOR 1985
In its USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 1-6 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 19 Jan. 1985 p 1-2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

The Expanded Session of the Ministry of Civil Aviation Collegium and the Aviation Workers Trade Union Central Committee Presidium took place in Moscow. Its participants analyzed the activities of that industry for the past year thoroughly and in detail and discussed missions for Aeroflot labor collectives in developing socialist competition. The completion ahead of schedule of the 1985 plan and the five-year-plan in general was also discussed.
Author

N85-23690# Joint Publications Research Service, Arlington, Va.
1ST DEPUTY MINISTER ON CIVIL AVIATION SUPPORT OF ECONOMY c03
M. Kashevnik *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 7-9 Transl. into ENGLISH from Sov. Rossiya (Moscow), 3 Feb. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

An interview with the U.S.S.R. first deputy minister of civil aviation is given. The effect of civil aviation on the overall national economy is discussed. New aircraft being entered into the national airline is also discussed.
E.R.

N85-23691# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER ON CIVIL AVIATION FUEL CONSERVATION EFFORTS c05
I. Mashkivskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 10-14 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 22 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

The final year of the 11th Five-Year Plan is 1985. The major and vital tasks which civil aviation workers have to resolve were taken up in detail. The most important feature of the 1985 plan is the high rate of production intensification. The entire increase in the volume of operations must be ensured by increasing flight productivity and by reducing the proportionate consumption of aviation fuel.
Author

N85-23692# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER ON CIVIL AVIATION CONSTRUCTION PROJECTS c09
V. Belikov *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 15-16 Transl. into ENGLISH from Izv. (Moscow), 23 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

Aeroflot's objectives in the final year of the five-year plan were discussed at an expanded meeting of the Ministry of Civil Aviation collegium and the presidium of the Aviation Workers Union central committee. Together with many other aspects of air transport, considerable attention was devoted to the development of ground structures and services and the construction of airports and air terminals.
Author

N85-23693# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS IN PERSONNEL NEEDED FOR BETTER FLIGHT SAFETY c03
Yu. Kolesnikov *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 17-20 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 24 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

Flight safety is that generalized indicator in accordance with which the level of professional skill is evaluated along with the quality of training of flight controller, and engineering and technical personnel. The status of organized operation and discipline in flight subunits, in the traffic services, and in the technical maintenance services of air maintenance bases is also evaluated. The ground services and the effectiveness of organizational and political education work in a collective is reviewed.
Author

N85-23694# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
21 Mar. 1984 112 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-008) Avail: NTIS HC A06

Many facets of transportation in the U.S.S.R. are discussed. Included among these topics are civil aviation, motor vehicles and highways, rail transportation, marintine and river fleets and ports and transhipment centers. For individual titles, see N85-23695 through N85-23698.

N85-23695# Joint Publications Research Service, Arlington, Va.
MINISTER BUGAYEV REVIEWS 1983 CIVIL AVIATION WORK, SETS COURSE FOR 1984
B. P. Bugayev *In its* USSR Rept.: Transportation (JPRS-UTR-84-008) p 1-8 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 1, Jan. 1984 p 2-5 (For primary document see N85-23694 14-01)
Avail: NTIS HC A06

Civil aviation work is reviewed for the year 1983. Industry in U.S.S.R. is examined. The policies and plans of the Soviets are given in light of aviation personnel. The minister sets the course for 1984.
E.R.

N85-23696# Joint Publications Research Service, Arlington, Va.
BUGAYEV ON CIVIL AVIATION MINISTRY'S 1983 ACHIEVEMENTS
B. P. Bugayev *In its* USSR Rept.: Transportation (JPRS-UTR-84-008) 21 Mar. 1984 p 9-14 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 7, Feb. 1984 p 2 (For primary document see N85-23694 14-01)
Avail: NTIS HC A06

Aeroflot, the U.S.S.R. commercial airline, has its achievements for 1983 recorded. Emphasis is placed on the conservation of aviation fuel and how it impacts on the nation's economy. Plans for 1984 are outlined.
E.R.

N85-23697# Joint Publications Research Service, Arlington, Va.
MINISTRY OFFICIALS ON IMPROVING AIRCRAFT TECHNICAL SERVICING
A. Solovyev and V. Gorlov *In its* USSR Rept.: Transportation (JPRS-UTR-84-008) 21 Mar. 1984 p 15-18 Transl. into ENGLISH from Vozdushnyy Transp. (Moscow), 15 Nov. 1983 p 2-3 (For primary document see N85-23694 14-01)
Avail: NTIS HC A06

The problem of improving the technical servicing of aircraft is discussed. The need for higher efficiency in the operation of costly aviation hardware and the increasingly strict requirements concerning the safety and regularity of flights is expressed. The design and production of modern and automated diagnostic and nondestructive control devices is reviewed.
E.R.

N85-23698# Joint Publications Research Service, Arlington, Va.
RIGA INSTITUTE SEEKING FASTER INTRODUCTION OF NEW TECHNOLOGY
V. Makeyev *In its* USSR Rept.: Transportation (JPRS-UTR-84-008) 21 Mar. 1984 p 18-21 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 10, Oct. 1983 p 24 (For primary document see N85-23694 14-01)
Avail: NTIS HC A06

An automated system to analyze the quality of repair and reliability of aircraft engines has been introduced into industrial use, which has made it possible to significantly increase the operating life of TV-2-117 engines between overhauls. An automated system for diagnosing the basic functions of the systems of the I1-86 aircraft based on the accumulation, correlation and analysis of information from the flight data recorder is discussed. Introduction of the system ensures a high level of organization in the technical maintenance of the I1-86. The economic gain from these systems is analyzed. E.R.

N85-24188# Joint Publications Research Service, Arlington, Va.
MBB AUTOMATES AIRCRAFT PRODUCTION IN MANY FRG FACILITIES
Hellmut Penner *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 65-67 refs Transl. into ENGLISH from Flugrevue (Munich), Dec. 1984 p 66-70 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-23699 Colorado Univ., Boulder.
THE UNSTEADY BOUNDARY LAYER ON AN ELLIPTIC CYLINDER FOLLOWING THE IMPULSIVE ONSET OF TRANSLATIONAL AND ROTATIONAL MOTION Ph.D. Thesis
Dana Francis Billings 1984 146 p
Avail: Univ. Microfilms Order No. DA8428635

For dynamic stall unsteadiness and delayed flow separation are essential. The fluid motion about an elliptic cylinder impulsively set into translational and rotational motion is studied by the method of matched asymptotic expansions for small times and large Reynolds number. Streamlines vorticity contours, and turning point diagrams marking the appearance and spread of reverse flow over the surface are generated and compared for various initial angles of attack and rates of rotation. A significant delay in the appearance of the leading edge separation bubble is found. The pressure distribution, and moment coefficients are calculated. Although in general these are dominated by the efects of the impulsive start, surprising variation with initial angle of attack, rotation rate, and location of the rotation leads to speculation on whether or not quite impulsive starting effects might be used by flying insects. Dissert. Abstr.

N85-23700# Admiralty Marine Technology Establishment, Teddington (England).
COMPARISON OF MEASURED AND COMPUTED BOUNDARY LAYERS AT THE TAIL-END OF AN AXISYMMETRIC BODY IN AN AIR-JET
G. J. Cooper Jan. 1983 28 p refs
(AMTE(N)-TM-83053; BR89415) Avail: NTIS HC A03/MF A01

A theoretical model, which predicts the potential flow and boundary layer development on an axisymmetric body placed in an open jet emerging from a nozzle was validated. The report describes the measurement of boundary layer velocity profiles at the tail end of an axisymmetric body in an air jet, and compares the results with the predictions of the computer program. Results have been obtained for a variety of relative positions of the body and the jet exit, with the jet emerging from either a straight duct or a convergent nozzle. Good agreement is obtained in most cases, although for extreme positions of the body in the duct the calculated boundary layer thickness is smaller than the measured value by almost 15%. The good agreement between measured and computed boundary layer parameters obtained in most cases gives confidence that the program can be used for determining future model test configurations for use in the Quiet Wind Tunnel, and for relating model data to full scale conditions. B.W.

N85-23701*# National Aeronautics and Space Administration, Washington, D. C.
OSCILLATING AIRFOILS AND THEIR WAKE
W. Send Apr. 1985 17 p ref Transl. into ENGLISH from "Schwingende Tragflaechen und ihr Nachlauf" rept. 42 DVFLR, Goettingen, West Germany, Jun. 1984 p 13-18 Original language document was announced in IAA as A84-42570 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77831; NAS 1.15:77831; Rept-42) Avail: NTIS HC A02/MF A01 CSCL 01A

The unsteady phenomena in the wake of an oscillating wing or rotor blade are examined theoretically using the Prandtl approximation of the vortex-transport equation. A mathematical model is developed and applied to such problems as the effect of winglets on the performance of fixed wings and the possibly of employing similar designs in rotor blades. Model predictions for several profiles are compared with published and experimental measurements, and good agreement is found. Graphs and diagrams are provided. Author

N85-23702*# Grumman Aerospace Corp., Bethpage, N.Y.
F-14A AIRCRAFT HIGH-SPEED FLOW SIMULATIONS
Charles W. Boppe and Bruce S. Rosen Apr. 1985 204 p refs
(Contract NAS1-14732)
(NASA-CR-172559; NAS 1.26:172559) Avail: NTIS HC A10/MF A01 CSCL 01A

A model of the Grumman/Navy F-14A aircraft was developed for analyses using the NASA/Grumman Transonic Wing-Body Code. Computations were performed for isolated wing and wing fuselage glove arrangements to determine the extent of aerodynamic interference effects which propagate outward onto the main wing outer panel. Additional studies were conducted using the full potential analysis, FLO 22, to calibrate any inaccuracies that might accrue because of small disturbance code limitations. Comparisons indicate that the NASA/Grumman code provides excellent flow simulations for the range of wing sweep angles and flow conditions that will be of interest for the upcoming F-14 Variable Sweep Flight Transition Experiment. Author

N85-23703*# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
THE STRUCTURE OF SEPARATED FLOW REGIONS OCCURRING NEAR THE LEADING EDGE OF AIRFOILS, INCLUDING TRANSITION Semiannual Status Report, Nov. 1984 - Apr. 1985
Thomas J. Mueller Apr. 1985 30 p refs
(Grant NsG-1419)
(NASA-CR-175670; NAS 1.26:175670) Avail: NTIS HC A03/MF A01 CSCL 01A

The structure and behavior of the separation bubble including transition and the redeveloping boundary layer after reattachment over an airfoil at low Reynolds numbers was studied. The intent is to further the understanding of the complex flow phenomena so that analytic methods for predicting their formation and development can be improved. These analytic techniques have applications in the design and performance prediction of airfoils operating in the low Reynolds number flight regime. G.L.C.

N85-23704*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATING UNSTEADY AERODYNAMIC FORCES ON A CASCADE IN A THREE-DIMENSIONAL TURBULENCE FIELD
Tom Norman and Wayne Johnson Mar. 1985 31 p refs
(NASA-TM-86701; A-85166; NAS 1.15:86701) Avail: NTIS HC A03/MF A01 CSCL 01A

An analytical method has been developed to estimate the unsteady aerodynamic forces caused by flow field turbulence on a wind tunnel turning vane cascade system (vane set). This method approximates dynamic lift and drag by linearly perturbing the

appropriate steady state force equations, assuming that the dynamic loads are due only to free stream turbulence and that this turbulence is homogeneous, isotropic, and Gaussian. Correlation and unsteady aerodynamic effects are also incorporated into the analytical model. Using these assumptions, equations relating dynamic lift and drag to flow turbulence, mean velocity, and vane set geometry are derived. From these equations, estimates for the power spectra and rms (root mean squared value, delta) loading of both lift and drag can be determined. Author

N85-23705*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

BIFURCATION THEORY APPLIED TO AIRCRAFT MOTIONS

W. H. Hui (Waterloo Univ., Ontario) and Murray Tobak Mar. 1985 17 p refs

(Grant NAGw-575)

(NASA-TM-86704; Rept-85171; NAS 1.15:86704) Avail: NTIS HC A02/MF A01 CSCL 01A

Bifurcation theory is used to analyze the nonlinear dynamic stability characteristics of single-degree-of-freedom motions of an aircraft or a flap about a trim position. The bifurcation theory analysis reveals that when the bifurcation parameter, e.g., the angle of attack, is increased beyond a critical value at which the aerodynamic damping vanishes, a new solution representing finite-amplitude periodic motion bifurcates from the previously stable steady motion. The sign of a simple criterion, cast in terms of aerodynamic properties, determines whether the bifurcating solution is stable (supercritical) or unstable (subcritical). For the pitching motion of a flap-plate airfoil flying at supersonic/hypersonic speed, and for oscillation of a flap at transonic speed, the bifurcation is subcritical, implying either that exchanges of stability between steady and periodic motion are accompanied by hysteresis phenomena, or that potentially large aperiodic departures from steady motion may develop. On the other hand, for the rolling oscillation of a slender delta wing in subsonic flight (wing rock), the bifurcation is found to be supercritical. This and the predicted amplitude of the bifurcation periodic motion are in good agreement with experiments. Author

N85-23706*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HOVER TEST RESULTS OF A SMALL-SCALE TWIN-TILT NACELLE MODEL

Susan B. Schmidt Mar. 1985 29 p refs

(NASA-TM-86665; Rept-85061; NAS 1.15:86665) Avail: NTIS HC A03/MF A01 CSCL 01A

Characteristics in hover of an 11/36%-scale, powered, twin-tilt nacelle model were measured in the NASA Ames Research Center's 40- by 80-Foot Wind Tunnel. The model was powered by two high-pressure air-driven turbofan propulsion simulators. The position of the sting-mounted model was fixed and a movable ground plane was used to vary ground height and orientation. Hover characteristics were investigated in and out of ground effect for roll angles of -2 deg to +14 deg and pitch angles of -15 deg to +10 deg. Results for the basic configurations are compared with data from hover tests of the full-scale tilt nacelle model. Two methods were investigated to increase vertical vane effectiveness: (1) extending the maximum vane deflection from 20 deg to 70 deg, and (2) adding a third vertical vane. The goal was to increase the roll-control capability to significantly reduce or balance the strong, unfavorable rolling moment created by the loss of one engine. Results indicate that the three-vertical-vane configuration is more effective than two vertical vanes and that extended vane deflections significantly reduce the engine-out roll in hover. Author

N85-23707*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CALIBRATION OF SONIC VALVES FOR THE LAMINAR FLOW CONTROL, LEADING-EDGE FLIGHT TEST

Dennis H. Petley, William Alexander, Jr., Andrew S. Wright, Jr., and Maria Vallas May 1985 53 p refs

(NASA-TP-2423; L-15893; NAS 1.60:2423) Avail: NTIS HC A04/MF A01 CSCL 01A

Sonic needle valves were calibrated to measure and control airflow in the suction system for the leading-edge flight test. The procedure and results for the calibration flow test of 4:41 flight valves are given. Mass-flow rates, which ranged from 0.001 to 0.012 lbm/sec, and maximum back pressure were measured for total temperatures from -30 F to 75 F and total pressures from 120 to 540 psf. Correlating equations are obtained for mass-flow rate as a function of total pressure, total temperature, and valve opening length. The most important aspect of flow measurement and control is found to be the measurement of valve opening length. E.A.K.

N85-23708*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LOW-SPEED STABILITY AND CONTROL WIND-TUNNEL INVESTIGATIONS OF EFFECTS OF SPANWISE BLOWING ON FIGHTER FLIGHT CHARACTERISTICS AT HIGH ANGLES OF ATTACK

Dale R. Satran, William P. Gilbert, and Ernie L. Anglin May 1985 46 p refs

(NASA-TP-2431; L-15851; NAS 1.60:2431) Avail: NTIS HC A03/MF A01 CSCL 01A

The effects of spanwise blowing on two configurations representative of current fighter airplanes were investigated. The two configurations differed only in wing planform, with one incorporating a trapezoidal wing and the other a 60 delta wing. Emphasis was on determining the lateral-directional characteristics, particularly in the stall/departure angle-of-attack range; however, the effects of spanwise blowing on the longitudinal aerodynamics were also determined. The-tunnel tests included measurement of static force and forced-oscillation aerodynamic data, visualization of the airflow changes created by the spanwise blowing, and free-flight model tests. The effects of blowing rate, chordwise location of the blowing ports, asymmetric blowing, and blowing on the conventional aerodynamic control characteristics were investigated. In the angle-of-attack regions in which the spanwise blowing substantially improved the wing upper-surface flow field (i.e., provided reattachment of the flow aft of the leading-edge vortex), improvements in both static and dynamic lateral-directional stability were observed. Blowing effects on stability could be proverse or adverse depending on blowing rate, blowing port loaction, and wing planform. Free-flight model tests of the trapezoidal wing confirmed the beneficial effects of spanwise blowing measured in the static and dynamic force tests. A.R.H.

N85-23709*# Flow Simulations, Inc., Sunnyville, Calif.

COMPUTATIONS OF TWO-DIMENSIONAL AIRFOIL-VORTEX INTERACTIONS Final Report

Ganapathi R. Srinivasan Washington NASA May 1985 88 p refs

(Contract NAS2-11331)

(NASA-CR-3885; NAS 1.26:3885; FSI-84-01) Avail: NTIS HC A05/MF A01 CSCL 01A

A procedure for calculating the interaction of a vortex with a two dimensional airfoil in a uniform free stream is presented along with results for several test cases. A Lamb like anaytical vortex having a finite core and convect in a uniform free stream interacts with the flowfield of NACA 0012 or NACA 64A006 airfoil in transonic and subsonic flow. Euler and thin layer Navier-Stokes solutions are computed and the results are compared with the results from transonic small disturbance code and available experimental results. For interactions within the limits of transonic small disturbance assumptions, the three methods gave qualitatively similar results of a two bladed helicopter rotor and suggest that the time lag effects of the free stream velocity approaching the blade may be important and should be considered in the analysis. In general, the results show a tremendous influence of the interacting vortex on the flowfield around the airfoil. This is particularly true when the vortex is stationary. For a convecting vortex, the most dramatic changes in the flowfield seem to occur when the vortex is within one chord of the airfoil. A.R.H.

N85-23710*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT TRANSONIC UNSTEADY PRESSURE MEASUREMENTS AT THE NASA LANGLEY RESEARCH CENTER
M. C. Sandford, R. H. Ricketts, and R. W. Hess Apr. 1985 21 p refs Presented at the 2nd Intern. Symp. on Aeroelasticity and Struct. Dyn., Aachen, 1-3 Apr. 1985
(NASA-TM-86408; NAS 1.15:86408; Paper-85-23) Avail: NTIS HC A02/MF A01 CSCL 01A

Four semispan wing model configurations were studied in the Transonic Dynamics Tunnel (TDT). The first model had a clipped delta planform with a circular arc airfoil, the second model had a high aspect ratio planform with a supercritical airfoil, the third model has a rectangular planform with a supercritical airfoil and the fourth model had a high aspect ratio planform with a supercritical airfoil. To generate unsteady flow, the first and third models were equipped with pitch oscillation mechanisms and the first, second and fourth models were equipped with control surface oscillation mechanisms. The fourth model was similar in planform and airfoil shape to the second model, but it is the only one of the four models that has an elastic wing structure. The unsteady pressure studies of the four models are described and some typical results for each model are presented. Comparison of selected experimental data with analytical results also are included. Author

N85-23711*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATION OF THREE-DIMENSIONAL, VISCOUS FLOW THROUGH TURBOMACHINERY BLADE PASSAGES BY PARABOLIC MARCHING
Theodore Katsanis 11 Jul. 1985 29 p refs Proposed for presentation at 21st Joint Propulsion Conf., Monterey, Calif., 8-11 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-86984; E-2527; NAS 1.15:86984) Avail: NTIS HC A03/MF A01 CSCL 01A

The three-dimensional compressible Navier-Stokes equations are formulated in a rotating coordinate system, so as to include centrifugal and Coriolis forces. The equations are parabolized by using a previously calculated inviscid static pressure field. The thin layer Navier-Stokes approximation, which neglects streamwise diffusion, is used. A body-fitted coordinate system is used. The streamwise momentum equation is uncoupled from the cross-stream momentum equation by using contravariant momentum components, and then using the contravariant velocity components as primary unknowns. To reduce problems with small separated regions, the Reyhner and Flugge-Lotz approximation is used. The energy equation is included to allow for calculation of heat transfer. The flow may be laminar, or a simple eddy-viscosity turbulence may be used. A number of curved ducts and an axial stator were analyzed, including cases for which experimental data are available. Author

N85-23712# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
BOUNDARY LAYER CONTROL BY TRANSITION FIXING
Sep. 1984 145 p refs Partly in ENGLISH and GERMAN Proc. of DGLR-Fachausschusses Versuchswesen der Fluid- u. Thermodyn., Berlin, 24-25 Nov. 1983 Report will also be announced as translation (ESA-TT-909)
(DFVLR-Mitt-84-17; ISSN-0176-7739) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 39

Application of wind tunnel results to aerodynamic performance of large aircraft is treated. Boundary layer transition control for takeoff and landing configurations; transition fixing for transonic transport-type aircraft configurations; transition fixing in the high speed range for the development of civil aircraft wings; and transition fixing on wings in industrial wind tunnels are discussed. The influence of transition strips on the pressure distribution on transonic profiles; and the development of an artificial boundary layer for different outlet flows are presented. The conditions for tripping transition with roughness elements and their influence on boundary layer development are discussed. Transition fixing and simulation of high Reynolds number flow at transonic velocities are treated. Transition detection using surface pressure holes, and the detection of boundary layer transitions by wall shear stress and wall pressure fluctuation measurements are discussed. For individual titles, see N85-23713 through N85-23723.

N85-23713# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Unternehmensbereich Transport- und Verkehrsflugzeuge.
PROBLEMS OF THE APPLICATION OF WIND TUNNEL RESULTS TO AERODYNAMIC PERFORMANCE OF LARGE AIRCRAFT [PROBLEME DER UEBERTRAGUNG VON WINDKANALERGEBNISSEN AUF DIE AERODYNAMISCHEN LEISTUNGEN DER GROSSFLUGZEUGE]
R. Hilbig *In* DFVLR Boundary Layer Control by Transition Fixing 1924 p 9-17 In GERMAN (For primary document see N85-23712 14-02)
Avail: NTIS HC A07/MF A01

The utilization of unambiguous, reproducible wind tunnel results as a basis for the prediction of large aircraft performances and properties under flight conditions is discussed. It is shown that unambiguous wind tunnel results are absolutely required in the different aircraft development phases. This unambiguity is only possible with a transition fixing which is demonstrated to be laminar-turbulent. The boundary layer falsification by size and position and the fixing measures has to be minimized. This leads to requirements for the minimum Reynolds number domain that has to be reached in the wind tunnel. Additional experimental information about the boundary layer development under three-dimensional conditions and about the blow-away field are necessary to improve the numerical-experimental method to apply wind tunnel results to flight conditions. Author (ESA)

N85-23714# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Unternehmensbereich Transport- und Verkehrsflugzeuge.
BOUNDARY LAYER TRANSITION CONTROL FOR TAKEOFF AND LANDING CONFIGURATIONS [GRENZSCHICHTUMSCHLAGSTEUERUNG FUER STARTUNG- UND LANDEKONFIGURATIONEN]
H. P. Franz *In* DFVLR Boundary Layer Control by Transition Fixing 1924 p 19-31 refs In GERMAN (For primary document see N85-23712 14-02)
Avail: NTIS HC A07/MF A01

Wind tunnel test results were scaled to predict aircraft performance at low speed phases, taking into account Reynolds number effects. A possibility to define scaling laws is to fix the boundary layer transition from laminar to turbulent spatially in the model by artificial surface roughness. The boundary layer transition control has to be demonstrated by preliminary tests. The practical realization of surface roughness taking into account the required Mach-Reynolds combination and lift value is discussed. The method allows scaling to large aircraft of project-aerodynamic performance prediction. Author (ESA)

N85-23715# National Aerospace Lab., Amsterdam (Netherlands).
EXPERIENCES WITH TRANSITION FIXATION IN THE HIGH-SPEED REGIME AT NLR
A. Elsenaar *In* DFVLR Boundary Layer Control by Transition Fixing 1924 p 33-54 (For primary document see N85-23712 14-02)
Avail: NTIS HC A07/MF A01

Transition fixing for transonic transport-type aircraft configurations is discussed. The use of wind tunnel measurements for flight prediction is explained, and practical problems of the fixing technique are discussed. Tests with free transition are qualitatively not representative for full scale. In order to predict flight conditions, extrapolation of Reynolds number trends is preferred; the aft-fixing technique is complementary when separations are expected at (low) tunnel Reynolds numbers. Author (ESA)

N85-23716# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Unternehmensbereich Transport- und Ver-

kehrsflugzeuge.

TRANSITION FIXING IN THE HIGH SPEED RANGE FOR THE DEVELOPMENT OF CIVIL AIRCRAFT WINGS [TRANSITIONSFIXIERUNG IM HOCHGESCHWINDIGKEITSBEREICH BEI DER FLUEGELENTWICKLUNG FUER ZIVILE FLUGZEUGE]

W. Burgsmueller *In* DFVLR Boundary Layer Control by Transition Fixing Sep. 1984 p 55-79 In GERMAN (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

Boundary layer transition fixing for the prediction of Airbus performance is discussed. Comparative measurements were conducted on competing aircraft. The effects of strip position and grain size on transition fixing are presented. The Delta method is used to determine the difference between wind tunnel tests and flight tests. The method to predict aircraft performances based on wind tunnel tests is explained. The presented fixing technique is very time consuming. Comparison between wing profiles are possible under certain conditions. The scaling by the Delta method provides usable results. Author (ESA)

N85-23717# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TRANSITION FIXING ON WINGS IN INDUSTRIAL WIND TUNNELS AND ASSOCIATED PROBLEMS [UMSCHLAGFIXIERUNG AM TRAGFLUEGEL IN INDUSTRIEWINDKANAELEN UND DAMIT BEHAFTETE PROBLEME]

V. Schmitt *In* DFVLR Boundary Layer Control by Transition Fixing Sep. 1984 p 81-87 ref In GERMAN (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

A method for transition fixing on wings, based on the utilization of carborundum strips to produce an homogeneous turbulent boundary layer is presented. The choice of strip position and grain size is explained. The transition is visualized by thermography using an IR camera. The influence of the transition fixing is demonstrated. Problems in scaling the simulation results for high Reynolds numbers to large aircraft are discussed. Author (ESA)

N85-23718# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfsaerodynamik.

THE INFLUENCE OF TRANSITION STRIPS ON THE PRESSURE DISTRIBUTION ON TRANSONIC PROFILES [DER EINFLUSS VON TRANSITIONSSTREIFEN AUF DIE DRUCKVERTEILUNG BEI TRANSSONISCHEN PROFILEN]

R. Mueller *In its* Boundary Layer Control by Transition Fixing Sep. 1984 p 89-99 refs In GERMAN (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

Transonic wind tunnel tests were performed to determine the influence of transition strips on pressure distribution. Measurements were performed on three transport aircraft profiles, covering the Mach number range from 0.70 to 0.80. The transition strips are produced with Korund grain 22.0k according to the DFVLR-TWB standard method and have a width of 1% of the model profile depth. The influence of the strips on the upper surface of the profile is extremely large, even far downstream, and also for high Reynolds numbers. The influence on the lower surface in the rear loading domain strongly decreases for high Reynolds numbers. The Reynolds number effect in free transition is orders of magnitude lower. At constant Reynolds number an increasing Mach number enhances the influence on the rear loading of the lower surface. The influence of the strips on the pressure distribution is shown for several cases. Author (ESA)

N85-23719# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.

DEVELOPMENT OF AN ARTIFICIAL BOUNDARY LAYER FOR DIFFERENT OUTLET FLOWS [UEBER DIE ENTWICKLUNG EINER KUENSTLICHEN GRENZSCHICHTSTOERUNG BEI UNTERSCHIEDLICHER AUSSENSTROEMUNG]

H. U. Meier and H.-P. Kreplin *In its* Boundary Layer Control by Transition Fixing Sep. 1984 p 101-102 refs In GERMAN (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

Problems related to the wind tunnel technique using trip wires or surface roughness to produce an artificial laminar-turbulent boundary layer transition, are discussed. Artificial roughness on the surface causes loss in the boundary layer which is maintained downstream. Analysis shows that the development of this momentum loss downstream depends strongly on the outlet flow. A reaction on the boundary layer separation behavior can be expected. The development of a boundary layer momentum loss produced by a wire in a retarded outlet flow was experimentally studied; the results agree well with calculated values.

Author (ESA)

N85-23720# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. of Aerothermodynamics.

INVESTIGATION OF THE CONDITIONS FOR TRIPPING TRANSITION WITH ROUGHNESS ELEMENTS AND THEIR INFLUENCE ON BOUNDARY LAYER DEVELOPMENT

R. Michel and D. Arnal *In* DFVLR Boundary Layer Control by Transition Fixing 1924 p 103-113 (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

Boundary layer tripping with transverse wires or carborundum bands, in zero and nonzero pressure gradients, was experimentally studied using a flat plate in incompressible flow, for a great number of tripping devices. It appears that high turbulence intensities are not created on the roughness itself, but rather in the downstream separated region. The critical grain size required for fixing transition at the roughness location is plotted. Increasing the grain size produces an overthickness of the boundary layer due to the roughness drag. The drag coefficient increases when the roughness height is larger than the boundary layer thickness. Similar results are obtained in negative and positive pressure gradients. Applications on wing profiles in incompressible and compressible flows are presented. Author (ESA)

N85-23721# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.

TRANSITION FIXING AND SIMULATION OF HIGH REYNOLDS NUMBER FLOW AT TRANSONIC VELOCITIES

E. Stanewsky *In its* Boundary Layer Control by Transition Fixing Sep. 1984 p 115-129 refs (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

The simulation of two-dimensional high Reynolds flow was investigated. Airfoil tests up to relatively high Reynolds numbers, using airfoils of various sensitivities to Reynolds number changes, show that the initial displacement thickness has a dominant influence on the flow development about transonic airfoils. The duplication of the initial displacement thickness seems adequate to simulate high Reynolds number flow with shock waves, at least for free stream conditions without excessive separated regions. The possible errors associated with such a simulation and the simultaneous simulation of all aerodynamic parameters are considered. This simulation seems to be applicable to separated flow. It is concluded that the method allows simulation of two-dimensional high Reynolds number flow. Author (ESA)

N85-23722# National Aerospace Lab., Emmeloord (Netherlands).

TRANSITION DETECTION USING SURFACE PRESSURE HOLES

B. vandenBerg *In* DFVLR Boundary Layer Control by Transition Fixing Sep. 1984 p 131-138 refs (For primary document see N85-23712 14-02)

Avail: NTIS HC A07/MF A01

An experimental method to establish the boundary layer transition position on wind tunnel models is presented. The information whether the boundary layer is laminar or turbulent is present in the static pressure holes in the surface of wind tunnel models since the surface static pressure beneath a turbulent

boundary layer fluctuates, while it does not with a laminar flow. This pressure fluctuation level is very small. A much larger fluctuation level exists when blowing through the surface hole is applied. The pressure fluctuations are measured with a microphone. The amplification effect of blowing through the hole on the fluctuating output of the microphone is determined. The fluctuating pressure level attains a maximum in the transition region. A clear maximum is still apparent when long tubes are used between the pressure hole and the microphone. It is concluded that transition detection using surface static pressure holes is feasible.
Author (ESA)

N85-23723# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
INVESTIGATIONS OF THE EXPERIMENTAL DETECTION OF BOUNDARY LAYER TRANSITIONS
W. Nitsche, R. Thuenker, and C. Haberland *In* DFVLR Boundary Layer Control by Transition Fixing Sep. 1984 p 139-144 refs In GERMAN (For primary document see N85-23712 14-02)
Avail: NTIS HC A07/MF A01

Wind tunnel tests to detect boundary layer transitions based on the measurement of wall shear stress and local wall pressure fluctuations were performed. The detection of transition using these two methods is demonstrated for simple transition flows (flat plate, pipe entrance). For wall shear stress measurement, surface hot-film, sublayer fence and computational Preston tube can be used in transition flows, while the conventional Preston tube gives only qualitative information. The strong increase of the local wall pressure fluctuations due to the boundary layer transition enables a transition detection using pressure transducers with high time resolution and sensors reacting to pressure fluctuations, such as piezofoils. Comparison of several foil signals allows the transition domain to be localized. Author (ESA)

N85-23724# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
TRANSONIC MERGING SEPARATED FLOWS Final Report, 1 May 1983 - 30 Apr. 1984
K. Koenig Jul. 1984 99 p
(Grant AF-AFOSR-0179-83)
(AD-A150667; AFOSR-85-0096TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

This study considers an arrangement of a plane-nosed circular cylinder with a smaller diameter plane-nosed cylindrical probe coaxially extending ahead in a transonic axial flow. This configuration is a prototype for a low drag forebody replacing more conventional streamlined nose fairings. Apparently only one previous study is available in open literature which clearly shows reductions in transonic forebody drag for such arrangements. In view of the lack of data on transonic flow past probe/cylinder configurations, an attempt is made to construct the flow field based on data for related and component flows. The flow is modelled as the merging of several component, separated flows. Component flows are axisymmetric plane-nosed cylinders and axisymmetric forward-facing steps. Related flows include rearward-facing steps, cavities and bases. Relatively little data are available in the open literature concerning transonic flow past any of these arrangements, especially for axisymmetric geometries. The data which is available is discussed for insights which might be gained regarding probe/cylinder flows; emphasis is given to a plane-nosed cylinder flows and the opening phenomenon associated with cavity flows. A simple, semi-empirical free streamline model is developed for the postulated flow field of a low-drag probe/cylinder configuration. Partial agreement with inferences from related experimental data is obtained. GRA

N85-23725# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
LOW-SPEED CHARACTERISTICS OF A CIRCULATION CONTROL AIRFOIL WITH AFT CAMBER AND A SPIRAL TRAILING EDGE Final Report
J. Abramson Dec. 1984 41 p
(AD-A150851; DTNSRDC/ASED-84/07) Avail: NTIS HC A03/MF A01 CSCL 20/4

A circulation control elliptic airfoil section with a 15-percent thickness-to-chord ratio which incorporates a spiral trailing edge was evaluated subsonically to determine its aerodynamic characteristics. The spiral-shaped Coanda surface was previously evaluated with a different leading edge. The airfoil, designated NCCR 1505-7567S, has an uncambered forward half and a cambered aft portion resulting in a 0.005-percent camber for the profile. This particular combination of camber was selected because it was analytically predicted to have good critical Mach number characteristics in the range of interest. The range of momentum coefficient was limited due to the relatively early onset of Coanda jet-tunnel floor interference; however, lift coefficients in the excess of 4.25 were produced at momentum coefficients of 0.16. Equivalent lift-to-drag ratios in excess of 40 were also produced when lift coefficient reached approximately 1.0. GRA

N85-23726# Institut Franco-Allemand de Recherches, St. Louis (France).
INVESTIGATION OF THE TURBULENT SEPARATED FLOW BEHIND A SPOILER [UNTERSUCHUNG DER TURBULENTEN ABGELOESTEN STROEMUNG HINTER EINEM SPOILER]
P. Meyer, G. Koerber, and B. C. Jaeggy 15 Nov. 1983 28 p refs In GERMAN Presented at 4th DGLR Fachsymp. ueber Stroemungen mit Abloesung, Goettingen, West Germany, 10-12 Oct. 1983 Original contains color illustrations
(Contract DRET-82/318)
(ISL-CO-240/83) Avail: NTIS HC A03/MF A01

The flow around a wing profile equipped with a spoiler was studied in a subsonic wind channel using two-dimensional laser anemometry. The profile is a supercritical RA16-SC1 wing with a spoiler at the upper side, the angle of attack of which can be 10, 20, and 40 deg. The Reynolds number determined with the profile depth is 400,000. For comparison measurements are also conducted without spoiler. The average values of the velocity components, the turbulent quantities, and the turbulent shear stress are determined with the laser anemometer. For each spoiler angle of attack, the aerodynamic field around the wing is determined by 40 to 60 velocity and fluctuation profiles. The pressure coefficients are determined by 78 pressure measurement points in the profile.
Author (ESA)

N85-23727# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abt. Aeroelastik bei abgeloester Stroemung.
INVESTIGATION OF THE AERODYNAMIC FORCES ON BLUFF BODIES AT HIGH REYNOLDS NUMBERS Final Report
Guenter Schewe Nov. 1984 33 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-914)
(Contracts DFG-FO-84/6; DFG-FO-84/7; DFG-FO-85/8-3; DFG-FO-84/8-4)
(DFVLR-Mitt-84-19; ISSN-0176-7739) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 13

Steady and unsteady forces acting on a circular cylinder, a square-section cylinder and an H-profile (Tacoma Bridge) were investigated in a pressurized wind tunnel (very high Reynolds numbers). The forces were measured by a piezo-multicomponent balance, with a large dynamic range, low interference and a high natural frequency. The Reynolds number (Re) range between 20,000 and 7 million is investigated with the same circular cylinder and balance by varying flow velocity and air density. In the critical Reynolds number range, bistable asymmetric flow states are observed, which can be controlled by a very small perturbation. The investigation of the square section reveals no strong Reynolds number effects in the range Re between 100,000 and 4 million. The Tacoma profile is shown to be aeroelastically unstable in torsion mode. Author (ESA)

N85-23728# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
CALCULATION OF AN UNSTEADY TRANSONIC FLOW WITH SHOCK WAVES AND SEPARATION IN LAVAL NOZZLES

[BERECHNUNG EINER INSTATIONAEREN TRANSSONISCHEN STROEMUNG MIT VERDICHTUNGSSTOESSEN UND ABLOESUNG IN LAVALDUESEN]
M. Rein Oct. 1984 63 p refs In GERMAN
(MPIS-14/1984; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, Federal Republic of West Germany DM 12.90

A theoretical model of an unsteady periodic flow in a Laval nozzle was developed. The one-dimensional unsteady flow field in a Laval nozzle, resulting from the mutual effect of shock waves and backstreaming, is obtained downstream from the separation point by the method of characteristics. A simple model gives the motion of the separation point for the case in which the shock does not directly interact with the separation. The resulting flow is described. The agreement between the numerical results and experiments is good; differences only occur for unsteady separation. The dependence of the flow on final pressure and nozzle form are determined. Author (ESA)

N85-24107# Joint Publications Research Service, Arlington, Va.
EFFECT OF DRAG BEHIND NOZZLE ARRAY ON ITS FORCE AND ENERGY CHARACTERISTICS Abstract Only
D. N. Pyasik and M. S. Kolomiyets *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 71-72 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 6, Jun. 1983 p 10-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24110# Joint Publications Research Service, Arlington, Va.
STABILITY OF VORTEX STRUCTURES DURING SEPARATION FLOW PAST ARRAY OF WINGS Abstract Only
A. A. Karask, S. M. Lomov, and M. I. Nisht *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 73 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 6, Oct. 1983 p 1318-1321 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24179# Joint Publications Research Service, Arlington, Va.
PROBLEM OF REDUCTION TO IDEAL TUBE IN EXPERIMENTAL AERODYNAMICS Abstract Only
N. N. Yanenko, Yu. Ye. Voskoboynikov, and N. G. Preobrazhenskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 44 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1209-1312 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-23729*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEEDINGS: SEVENTH ANNUAL WORKSHOP ON METEOROLOGICAL AND ENVIRONMENTAL INPUTS TO AVIATION SYSTEMS Final Report
Dennis W. Camp, ed., Walter Frost, ed., and Linda W. Hershman, ed. Apr. 1984 143 p refs Workshop held in Tullahoma, Tenn., 26-28 Oct. 1983 Previously announced in IAA as A85-18324 Prepared in cooperation with Tennessee Univ. Space Inst., Tullahoma
(Contract NAS8-36177)
(NASA-CP-2312; NAS 1.55:2312) Avail: NTIS HC A07/MF A01 CSCL 01C

Reports and recommendations resulting from the Workshop on Meteorological and Environmental Inputs to Aviation Systems are presented. The topics covered included winds and shear, turbulence, fog, visibility and ceiling, lightning and atmospheric electricity, icing, frost and snow, rain ozone and acid rain. The recommendations issued included a denser meteorological network with more automated stations, the development of radar systems for icing forecasts and wind shear alerts, the accumulation of a greater data base on convective cells and lightning strikes, and further study of the impact of rain on aircraft performance. For individual titles, see N85-23730 through N85-23742.

N85-23730*# Federal Aviation Administration, Washington, D.C. Weather Coordination Program Staff.
OVERVIEW OF METEOROLOGICAL INPUTS TO NASP
James C. Dziuk *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 13-16 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 01C

The key elements of the present aviation weather system are reviewed and short and long term planned system improvements are described. Unmet information needs are also identified. Some of the near term activities include: revised pilot briefing procedures, Central Weather Service Unit directive revision, the radar remote weather display system program, enhanced Low Level Wind Shear Alert System, and Automated Weather Observation System demonstration. Long term programs include: the National Airspace Data Interchange network, central weather processor, next generation weather radar, and the mode-S data link. M.G.

N85-23731*# Delta Air Lines, Inc., Atlanta, Ga. Weather Analysis.
AIRLINE METEOROLOGICAL REQUIREMENTS c47
C. L. Chandler and John Pappas (Western Airlines) *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 17-18 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

The meteorological information requirements necessary for airlines to reach and maintain their objectives for safety, economy, and convenience are identified. Weather data communication reliability, upper air observations and forecasts, radar systems development, and upper wind forecasts are all addressed. M.G.

N85-23732*# Newton (Dennis W.), Reno, Nev.
GENERAL AVIATION'S METEOROLOGICAL REQUIREMENTS c47
Dennis Newton *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 19-27 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

An overview of the meteorological information requirements of general aviation is presented preceded by an outline defining the characteristics of general aviation and noncommercial pilot training. Thunderstorm and icing products, weather charts, and information dissemination are discussed. M.G.

N85-23733*# Business and Commercial Aviation, White Plains, N.Y.
CORPORATE/COMMUTER AIRLINES METEOROLOGICAL REQUIREMENTS c47
John W. Olcott *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 23-25 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

The incidence of inadequate preflight planning and weather as causal factors in civil aircraft accidents is examined and the meteorological information needs of corporate/commuter airlines are discussed. The requirements of such operations center principally on facilitating the communications of actual weather data, particularly data that influence schedule predictability, ride comfort, operating efficiency, an on using existing non-Flight Service Station communication facilities to input flight plan information. M.G.

N85-23734*# Federal Aviation Administration, Atlantic City, N.J.
OVERVIEW OF FAA'S AIRCRAFT ICING PROGRAM
Loni Czekalski *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 26-29 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 01C

The aircraft icing accident statistics which prompted the Federal Aviation Administration (FAA) to nitiate an icing program are examined and some of the history of user needs is reviewed. The FAA icing program funding plan and research and development requirements are described. Atmospheric and aircraft performance characterization, analytical and simulation methods, certification criteria, and the development of an international data base are discussed. M.G.

N85-23735*# National Aeronautics and Space Administration, Washington, D. C.
OVERVIEW OF NASA'S PROGRAMS c03
A. Richard Tobiason *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1985 p 30-35 (For primary document see N85-23729 14-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

The NASA programs which deal with the investigation of flight hazards and aviation meteorology are described. The major projects discussed include icing, clear and turbulence, fog, and landing systems. M.G.

N85-23736*# Coast Guard, Elizabeth City, N.C.
ADVERSE WEATHER IMPACT ON AVIATION SAFETY, INVESTIGATION AND OVERSIGHT
Mont J. Smith *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 37-42 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 01C

Flight experiences of Coast Guard personnel are related. Helicopter flight is emphasized and severe storm, winds, lightning, and icing conditions are discussed. M.G.

N85-23737*# Naval Research Lab., Washington, D. C. Experimental Cloud Physics Section.
A NEW CHARACTERIZATION OF THE ICING ENVIRONMENT BELOW 10,000 FEET AGL FROM 7,000 MILES OF MEASUREMENTS IN SUPERCOOLED CLOUDS c47
Richard K. Jeck *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 44-47 refs (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

About 7,000 nautical miles (NM) of airborne measurements in supercooled clouds at altitudes up to 10,000 feet (3 km) were computerized to form a data base for low-altitude, aircraft icing applications. Half of the data is from the National Advisory Committee for Aeronautics (NACA) aircraft icing studies of 1946-50 where ice accretion on rotating multicylinders was the primary measurement technique for liquid water content (LWC) and droplet size. The other half is from recent research flights using optical, cloud droplet size spectrometers. These measure droplet sizes, with LWC recorded droplet size distribution. The NACA and modern data generally agree in most aspects, indicating that the NACA data are accurate and reliable except possibly for indicated droplet diameters larger than 35 microns. The intermittent maximum and continuous maximum graphs (envelopes) in FAR-25, Appendix C, do not correctly describe the icing environment in the altitude range from 0 to 10,000 feet AGL. Differences in maximum values of LWC, upper and lower limit to the median volume diameter of cloud droplets, and temperature dependences of medium volume diameters are evident. A.R.H.

N85-23738*# Federal Aviation Administration, Atlantic City, N.J.
A NEW CHARACTERIZATION OF SUPERCOOLED CLOUDS BELOW 10,000 FEET AGL c47
Charles O. Masters *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 49-52 refs (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

A better characterization of supercooled clouds combines both layer and convective clouds, and encompasses three ambient temperature (Ta) dependent icing envelopes. The envelope of each of the temperature ranges encompass values with a probability of exceedance greater than one part in a thousand, whereas the extremes of the envelopes represent exceedance probabilities less than or equal to one part in a thousand. The rationale, date analysis, and data reduction procedures employed in the generation of the icing envelopes and other information which constitutes the better characterization are discussed. Potential applications of the characterization are discussed. A.R.H.

N85-23739*# Spectron Development Labs., Inc., Costa Mesa, Calif.
ADVANCE PARTICLE AND DOPPLER MEASUREMENT METHODS c35
Chris Busch *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 54-55 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 14B

The use of imaging and scattering methods to measure rain, ice, and snow particles in the natural environments in which aircraft fly and in simulation environments that are encountered in ground-test facilities is examined. The extraction of data from photographs using a computerized image analyzer and from holograms is considered. Advantages and disadvantages of single particle and ensemble approaches are reviewed. A.R.H.

N85-23740*# Flying Tigers-Retired, San Pedro, Calif.
DEVELOPMENT OF A WIND SHEAR PERFORMANCE ENVELOPE c47
John H. Bliss *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 55-57 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

Airplane performance during a continuing headwind loss is examined. Safe flight path control in a new airmass can only be assured by using a safe actual speed relative to the new airmass before entering. The safe speed cannot be resolved by using airspeed alone, which disregards the environment ahead. The best defense for take-off is examined and the airspeed/ground speed method for landing approach is assessed. A.R.H.

N85-23741*# Tennessee Univ. Space Inst., Tullahoma. Atmospheric Science Div.
LABORATORY MODEL OF FLIGHT THROUGH WIND SHEAR
Walter Frost *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 58-61 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 01C

Techniques used to simulate an airplane flying through a downdraft, or microburst for a commercial television program are described. A model airplane was used for the demonstration. High speed photographs show the plane as it flies into the wind shear, loses lift, pitches up, and hits the ground. It is suggested that a microburst is a cold outflow moving down towards the ground and spreading out in all directions, but not perfectly symmetrically A.R.H.

N85-23742*# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
A MODEL OF A DOWNBURST; A WIND TUNNEL PROGRAM ON PLANETARY BOUNDARY LAYER; AND AIRSHIP IN TURBULENCE c47

Bernard Etkin *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 61-66 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

Engineering models of turbulence at high altitude, of the planetary boundary layer, and of microbursts, must reflect reasonably well the reality physics and have parameters in them that can be varied to adjust the models to suit various circumstances. A typical microburst generated by a doublet sheet is illustrated and a 3-D model is compared for different strength distributions. A wind tunnel for simulating shear and turbulence is described for studying landing or takeoff through the planetary boundary layer. The feasibility of applying the slender-body/strip theory to determine the turbulence-induced forces on an airship was assessed. Transfer functions for the bare hull and the hull with fins are shown. A.R.H.

N85-23743# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-65
9 Jul. 1984 3 p
(Rept-3908) Avail: NTIS HC A02/MF A01

On February 15, 1983, the captain of an Eastern Airlines Boeing 727-225, N8831E, made an international gear-up landing at Miami International Airport after the actuating system of the left main landing gear had malfunctioned following takeoff from the West Palm Beach Airport. The Safety Board's preliminary investigation of the incident disclosed that the tires of the left main landing gear were jammed in the wheel-well door, which prevented extension of the gear either normally or manually, and that the attachment fitting for the landing gear door actuator as loose enough to move laterally. Consequently, the Safety Board issued Safety Board Recommendation A-83-2 on March 4, 1983, for correction of this condition. G.L.C.

N85-23744# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A84-111 THROUGH -115
25 Oct. 1984 4 p ref
(Rept-4011C/27) Avail: NTIS HC A02/MF A01

At 1926, on November 24, 1983, Air Canada Flight 965, a Lockheed L-1011, C-FTNJ, encountered severe clear air turbulence about 105 miles off the coast of Charleston, South Carolina. One flight attendant and three passengers, seriously injured during the encounter, were treated immediately by two physicians aboard the flight. The flight continued to its destination and landed without further incident about 1 1/2 hours later. The METTA controller had been relieved of the responsibility of broadcasting SIGMETS unde the terms of the FAA's Hazardous Inflight Weather Advisory Service (HIWAS). The flightcrew was not aware of a SIGMET 2 was in effect. The FAA Notice N 7110.658 directs that controllers at terminal and en route facilities discontinue broadcasting SIGMET information, and that FSS facilities discontinue broadcasting certain weather advisories and that SIGMET information be broadcast over selected very high frequency omni range (VOR) facilities instead. Recommendations are made to postpone implementation of HIWAS until broadcasting procedures are improved and information is widely disseminated and to designate communication frequencies within the 118 to 135 MHz band for each air traffic control center to broadcast. A.R.H.

N85-23745# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-103
31 Aug. 1984 2 p
(Rept-3909B/101B) Avail: NTIS HC A02/MF A01

On May 28, 1983, Republic Airlines Flight 366, a DC-9-30, was on a scheduled passenger flight from Fresno, California, to Phoenix, Arizona, when the flightcrew determined en route that the airplane was nearly out of fuel. The fuel low-pressure warning light for the right engine illuminated and the fuel quantity transfer relay circuit breaker opened. After the flightcrew closed the circuit breaker, the fuel quantity gages indicated that the fuel tanks were nearly empty. The flight was landed safety about 20 miles short of the destination airport. Post incident calculations established that Flight 366 departed Fresno with about 7,000 pounds of fuel rather than 15,000 pounds indicated on the fuel quantity totalizer. It is recommended that the FAA require all carrier operations inspectors to make fuel awareness on the part of the flightcrews, including fuel consumption planning and familiarity with the functioning of the fuel system and its instrument, a subject of special attention during the inspectors' flight check and surveillance duties. A.R.H.

N85-23746# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-93 THROUGH -95
15 Aug. 1984 6 p ref
(Rept-3983/33) Avail: NTIS HC A02/MF A01

About 0514 eastern standard time, on March 30, 1983, Central Airlines Flight 27, a Gates Learjet model 25, crashed during a landing attempt on runway 4 right at Newark International Airport, Newark, New Jersey. Flight 27 was operating as a nonscheduled cancelled bank check courier under 14 CFR Part 135. The airplane was destroyed on impact and the two pilots died as a result of the accident. The National Transportation Safety Board determined that the probable cause of the accident was: (1) loss of control following ground contact; (2) an unstabilized approach; and (3) likely impairment of the flightcrew's judgement, decision-making, and flying abilities by a combination of physiological and psychological factors. G.L.C.

N85-23747# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
FAA AVIATION FORECASTS: FISCAL YEARS 1985-1996
Feb. 1985 108 p
(AD-A151050; FAA-APO-85-2) Avail: NTIS HC A06/MF A01 CSCL 01/5

This report contains the Fiscal Years 1985-1996 Federal Aviation Administration (FAA) forecasts of aviation activity at FAA facilities. These include airports with FAA control towers, air route traffic control centers, and flight service stations. Detailed forecasts were made for the four major users of the national aviation system: air carriers, air taxi/commuters, general aviation and the military. The forecasts have been prepared to meet the budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, by the aviation industry and the general public. The overall outlook for the forecast period is for strong economic growth, relatively stable real fuel prices, and moderate inflation. Based upon these assumptions, aviation activity is forecast to increase by Fiscal Year 1996 by 62 percent at towered airports (commuters, 70 percent; air carrier, 28 percent; general aviation, 74 percent; military, 0 percent), 44 percent at air route traffic control centers (commuters 102 percent; air carriers, 38 percent; general aviation, 51 percent; military, -2 percent), and 47 percent in flight services performed. Hours flown by general aviation is forecast to increase 45 percent and helicopter hours flown 84 percent. Scheduled domestic revenue passenger miles (RPM's) are forecast to increase 78 percent, with scheduled international RPM's forecast to increase by 82 percent commuter RPM's forecast to increase by 100 percent. Author (GRA)

N85-23690# Joint Publications Research Service, Arlington, Va.
1ST DEPUTY MINISTER ON CIVIL AVIATION SUPPORT OF ECONOMY
M. Kashevnik *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 7-9 Transl. into ENGLISH from Sov. Rossiya (Moscow), 3 Feb. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

N85-23693# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS IN PERSONNEL NEEDED FOR BETTER FLIGHT SAFETY

Yu. Kolesnikov *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 17-20 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 24 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-23748# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-82 THROUGH -84
13 Aug. 1984 8 p
(Rept-3957) Avail: NTIS HC A02/MF A01

Between 4 p.m. and 5 p.m. on March 8, 1984, the National Transportation Safety Board received several telephone calls from witnesses who had observed aircraft flying close to toll buildings located in the Rosslyn, Virginia, area. These aircraft were conducting approaches to land at Washington National Airport, Washington, D.C. As a result of the reports and because of previous similar incidents investigated by the Safety Board, the Safety Board conducted a comprehensive investigation of the incidents. Ground witnesses, flight crews, and air traffic controllers were interviewed, flight data recorders (FDR) from involved aircraft were read out, and recorded radar data were plotted. An analysis of this information uncovered several safety hazards which warrant corrective action by the FAA. These involve the interpretation of descent profile altitude restrictions on instrument approach procedure charts, effectiveness of the minimum safe altitude warning system (MSAW), 1/ and air traffic controller procedures for issuing safety advisories to aircraft. A.R.H.

N85-23749# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
AN ANALYSIS OF THE IMPACTS OF THE AIRPORT RADAR SERVICE AREA (ARSA)
K. Geisinger Nov. 1984 42 p
(AD-A150954; FAA-APO-85-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

The Airport Radar Services Area (ARSA) is a new concept in thermal airspace design that has been proposed as a replacement for the Terminal Radar Service Area (TRSA) which has been installed at 137 locations in the U.S. The primary difference between them is that pilots can enter the TRSA without communicating with Air Traffic Control (ATC), while in the ARSA ATC service is mandatory. This report contains an analysis of data gathered both before and after the implementation of the ARSA at two lead sites. The analysis concludes that the ARSA produces a significant reduction in ε. collision risk at a moderate increase in controller workload with no significant impact on ATC service to the pilots. GRA

N85-23816*# Federal Aviation Administration, Washington, D.C.
DEVELOPMENT CONCERNS FOR SATELLITE-BASED AIR TRAFFIC CONTROL SURVEILLANCE SYSTEMS
Keith D. McDonald *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 39-62 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 17G

N85-24060# Joint Publications Research Service, Arlington, Va.
TWO-STAGE GYROCOMPASS Abstract Only
S. A. Shestov *In its* USSR Rept.: Eng. and Equipment 9 Feb. 1984 p 45-46 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 5, May 1983 p 45-50 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24081# Joint Publications Research Service, Arlington, Va.
FLIGHT SIMULATION FOR INERTIAL NAVIGATION SYSTEM Abstract Only
V. V. Aleksandrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 46 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat. Mekhan. (Moscow), no. 4, Jul. - Aug. 1983 p 95-99 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24172# Joint Publications Research Service, Arlington, Va.
DECOMPOSITION IN PROBLEM OF CORRECTING INERTIAL NAVIGATION SYSTEMS Abstract Only
V. I. Kalenova and V. M. Morozov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekh. Tverd. Tela (Moscow), no. 6, Jun. 1983 p 14-21 Previously announced in IAA as A84-21051 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24173# Joint Publications Research Service, Arlington, Va.
QUATERNION ALGORITHMS OF 3-DIMENSIONAL INERTIAL NAVIGATIONAL SYSTEMS Abstract Only
Yu. N. Chelnokov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekh. Tverd. Tela (Moscow), no. 6, Jun. 1983 p 14-21 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24382# Centre National pour l'Exploitation des Oceans, Brest (France). Service des Operations Navales.
THE ARGOS SYSTEM ABOARD RESEARCH VEHICLES: 1981 EXPERIMENT ABOARD THE LE SUROIT OCEANOGRAPHIC VESSEL AND THE OUTLOOK
J.-P. deLongueau *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 165-168 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
(CNEXO/DFT/OPNAV/82-05) Avail: NTIS HC A09/MF A01

N85-24416# Computer Sciences Corp., Bay St. Louis, Miss.
MOORED BUOY STATIONKEEPING AND LOCATION SYSTEM
R. F. Garrand *In* CNES Data Collection and Platform Location by Satellite 1984 16 p refs (For primary document see N85-24409 14-42)
(Contract NOAA-NA-80-QA-C-101)
Avail: NTIS HC A14/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-23750*# National Aeronautics and Space Administration, Washington, D. C.
THE DESIGN OF HIGH-PERFORMANCE GLIDERS
B. Mueller and V. Heuermann Mar. 1985 24 p Transl. into ENGLISH from "Auslegung von Hochleistungssegelflugzeugen" rept. DGLR-T-83-01 DGLR, Bonn, 1983 presented at Symp. on Probl. and Develop. Trends in Gen. Aviation, 1983 p 41-61 Symp. held in Friedrichshafen, West Germany, 24-25 Mar. 1983 Original language document was announced in IAA as A84-15408 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(NASA-TM-77772; NAS 1.15:77772; DGLR-T-83-01) Avail: NTIS HC A02/MF A01 CSCL 01C

A high-performance glider is defined as a glider which has

been designed to carry the pilot in a minimum of time a given distance, taking into account conditions which are as conveniently as possible. The present investigation has the objective to show approaches for enhancing the cross-country flight cruising speed, giving attention to the difficulties which the design engineer will have to overcome. The characteristics of the cross-country flight and their relation to the cruising speed are discussed, and a description is provided of mathematical expressions concerning the cruising speed, the sinking speed, and the optimum gliding speed. The effect of aspect ratio and wing loading on the cruising speed is illustrated with the aid of a graph. Trends in glider development are explored, taking into consideration the design of laminar profiles, the reduction of profile-related drag by plain flaps, and the variation of wing loading during the flight. A number of suggestions are made for obtaining gliders with improved performance. G.R.(IAA)

N85-23751*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN CONSIDERATIONS FOR HIGH-ALTITUDE, LONG-ENDURANCE, MICROWAVE-POWERED AIRCRAFT M.S. Thesis - George Washington Univ., Washington, D.C.
Hai Qua Nguyen (George Washington Univ., Washington, D.C.) Apr. 1985 136 p refs
(NASA-TM-86403; NAS 1.15:86403) Avail: NTIS HC A07/MF A01 CSCL 01C

The sizing and performance analyses have been conducted in the design of long-endurance, high-altitude airplanes. These airplanes receive power either continuously beamed from a phased array transmitter or intermittently beamed from a dish transmitter. Results are presented for the cases of flight in zero wind speed and nonzero wind speed. Sensitivity studies indicate that the vehicle size is relatively insensitive to changes in the transmitter size. Cost estimates were made using models that excluded the airplane cost. Using a reference payload, results obtained from array and dish configurations were compared. Comparisons showed savings in cost as well as smaller vehicle sizes when an array transmitter was used. Author

N85-23752*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
A RESEARCH PROGRAM IN ACTIVE CONTROL/AEROELASTICITY Semiannual Status Report, Oct. 1984 - Apr. 1985
Sep. 1984 9 p
(Grant NAG1-199)
(NASA-CR-175674; NAS 1.26:175674) Avail: NTIS HC A02/MF A01 CSCL 01C

Research activities concerning active control aeroelasticity are discussed. In aeroservoelastic system design of a flexible aircraft, it is often necessary to obtain specified steady state structural dynamic response and to maintain stability margins at both the plant (aircraft) input and output. The research during the present period is discussed. Steady state structural dynamic response constraints and gradients were formulated. Incorporation of the design software as an update to the PADLOCS synthesis software was examined. The stability margin improvement technique at both the plant input and output using singular value properties and constrained optimization method was validated. B.W.

N85-23753*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RELATIVE CONTROL EFFECTIVENESS TECHNIQUE WITH APPLICATION TO AIRPLANE CONTROL COORDINATION
Frederick J. Lallman Apr. 1985 18 p refs
(NASA-TP-2416; L-15864; NAS 1.60:2416) Avail: NTIS HC A02/MF A01 CSCL 01C

A method to select optimal combinations of the control variables of a linear system is reported. The combinations are chosen so that the control channels have their principal influences on selected fundamental modes of the system. A series of algebraic maximization problems is used to maximize the effects of the control channels on selected modes while simultaneously minimizing the effects on the remaining modes. The method is applied to the lateral and directional control of a linearized airplane model having ailerons, a rudder, and differential tail surfaces. Integration of these control eliminates oscillations present in the roll rate for a step lateral-control input and improves the sideslip response with reduced rolling motions for a step directional-control input. Inclusion of thrust-vectoring engine nozzles improves the roll rate capability of the airplane. E.A.K.

N85-23754*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATION OF AIRCRAFT BEHAVIOUR ON AND CLOSE TO THE GROUND
A. G. Barnes (British Aerospace Plc, Preston, England) and T. J. Yager Loughton, England AGARD Jan. 1985 66 p refs
(NASA-TM-87460; NAS 1.15:87460; AGARD-AG-285; ISBN-92-835-1490-4) Avail: NTIS HC A04/MF A01 CSCL 01C

A guide to the current state of the technology of simulating fixed-wing aircraft handling qualities and performance on or close to the ground is presented and pitfalls which may prevent an adequate implementation are indicated. The scope of possible applications in both aircraft design work and pilot training is considered and the requirements for mathematical model definitions and implementations are discussed. The current requirements for visual and motion systems, cockpit cueing, and software modelling are also reviewed, and illustrated with specific examples in areas of aircraft research and development studies and pilot training uses. Needs for further improvements and additional data acquisition are identified. Author

N85-23755*# Dynamics Research Corp., Wilmington, Mass.
OPERATION AND MAINTENANCE REQUIREMENTS OF THE ARMY REMOTELY PILOTED VEHICLE (RPV) Final Report
31 Oct. 1983 212 p refs Prepared for JPL
(Contract JPL-956554)
(NASA-CR-175714; JPL-9950-1029; NAS 1.26:175714; DRC-R430U) Avail: NTIS HC A10/MF A01 CSCL 01C

The Remotely Piloted Vehicle (RPV) system is being developed to provide the Army with a target acquistion, target location, and laser designation capability that will significantly enhance the effectiveness of the artillery. Iterative analyses of the manpower, personnel, and training (MPT) requirements for an RPV system configured to accomodate both a daylight television and a forward looking infrared (FLIR) mission payload subsystem (FMPS) and related support subsystems are examined. Additionally, this analysis incorporates a 24 hour-a-day operational scenario. Therefore, the information presented was developed with a view towards delineating the differences (or deltas) imposed by the new requirements resulting from FMPS/24 hour operating day functions. B.G.

N85-23756*# Dynamics Research Corp., Wilmington, Mass.
APPLICATION OF THE HARDMAN METHODOLOGY TO THE SINGLE CHANNEL GROUND-AIRBORNE RADIO SYSTEM (SINCGARS)
Jan. 1984 306 p Sponsored in part by NASA
(NASA-CR-175694; JPL-9950-1030; NAS 1.26:175694; DRC-R446U) Avail: NTIS HC A14/MF A01 CSCL 01C

The HARDMAN methodology was applied to the various configurations of employment for an emerging Army multipurpose communications system. The methodology was used to analyze the manpower, personnel and training (MPT) requirements and associated costs, of the system concepts responsive to the Army's requirement for the Single Channel Ground-Airborne Radio System (SINCGARS). The scope of the application includes the analysis of two conceptual designs Cincinnati Electronics and ITT Aerospace/Optical Division for operating and maintenance support addressed through the general support maintenance echelon. Author

N85-23757*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPACT STUDIES OF A 1/3-SCALE MODEL OF AN AIR

CUSHION VEHICLE
Robert H. Daugherty Apr. 1985 24 p refs
(NASA-TM-86360; L-15916; NAS 1.15:86360) Avail: NTIS HC A02/MF A01 CSCL 01C

An experimental investigation was conducted to determine the effects of various parameters of the impact performance of a 1/3-scale dynamic model of an air cushion vehicle. Impact response was determined by measuring the maximum values of variables, including sidelobe, front lobe, and cavity pressures, normal acceleration, pitch and roll angles, and vertical displacement during impact, for various combinations of drop height, initial pitch and roll angles, and forward speed. Increasing initial pitch angle increased the maximum values of the front lobe pressure, normal acceleration, nose down pitch angle, and to some extent, vertical displacement, but it inversely affected the maximum cavity pressure. Increasing the drop height of the model increased the potential energy of the system and generally produced larger responses over the entire range of variables measured, except for the roll angle after impact, which remained constant. Forward speed had no effect on the impact performance of the model, except for essentially doubling the maximum nose down pitch angle after impact at the maximum speed tested. Author

N85-23758# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
NOISE MEASUREMENT FLIGHT TEST: DATA/ANALYSES, HUGHES 500 D/E HELICOPTER
J. S. Newman, E. J. Rickley, T. L. Bland, and K. R. Beattie May 1984 78 p
(AD-A148110; FAA/EE-84-3) Avail: NTIS HC A05/MF A01 CSCL 01/3

The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise. This report is the third in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Hughes 500D/E test program involved the acquisition of detailed acoustical, position and meteorological data. This test program was designed to address a series of objectives including: (1) acquisition of acoustical data for use in assessing heliport environmental impact, (2) documentation of directivity characteristics for static operation of helicopters, (3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, (4) determination of noise event duration influences on energy dose acoustical metrics, (5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and (6) documentation of noise levels acquired using international helicopter noise certification test procedures. GRA

N85-23759# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
BASIC CONSIDERATION OF THE LIFTING CAPABILITY OF STOPPABLE ROTORS Final Report
A. W. Schwartz Dec. 1984 20 p
(ARPA Order 4238)
(AD-A150850; DTNSRDC/ASED-84/10) Avail: NTIS HC A02/MF A01 CSCL 20/4

Stoppable rotor designs involve the operation of the rotor through very high advance ratios and, thus, large regions of reverse flow as the rotor is slowed. Dual-slot, circulation control airfoils, such as those on an X-Wing rotor, produce useable lift in the reverse flow region. A simple method is developed to determine the critical flight condition where the capability of the rotor to produce lift is minimized. Expressions are derived relating the rotor retreating side mean dynamic pressure (indicative of lifting capability) and the lateral offset of the centroid of that dynamic pressure (indicate of roll moment capability) to the rotor geometry and flight conditions. The critical advance ratios predicted by these expressions are compared with the results from a more sophisticated rotor performance analysis. GRA

N85-23760# Lockheed-Georgia Co., Marietta.
ADVANCED LIFE ANALYSIS METHODS. VOLUME 4: TABULATED TEST DATA FOR ATTACHMENT LUGS Final Report, 3 Sep. 1980 - 30 Sep. 1984
K. Kathiresan and T. R. Brussat Wright-Patterson AFB, Ohio AFWAL Sep. 1984 310 p
(Contract F33615-80-C-3211)
(AD-A151016; LG82ER0117-4; AFWAL-TR-84-3080-Vol-4) Avail: NTIS HC A14/MF A01 CSCL 13/5

This report is Vol. 4 of a 6-part final report. Extensive experiments were conducted as a part of the assessment of damage tolerance of aircraft attachment lugs. Experimental results and the correlations with analytical predictions using the analysis methods developed under this contract were reported in Vol. 3 of the final report. In this volume, all the experimental test data generated are tabulated. The experiments were divided into two groups: Group 1 and Group 2. Group 1 consists of only simple straight shank male lugs and Group II consists of lug configuration commonly used in design practices such as tapered, dogbone, clevis and real aircraft lugs. This volume contains the tabulation of raw residual strength and fatigue crack growth data for both groups of tests. This volume also contains the baseline material property data, crack initiation test results and details of different loading spectra used in testing. GRA

N85-23761# Lockheed-Georgia Co., Marietta.
ADVANCED LIFE ANALYSIS METHODS. VOLUME 5: EXECUTIVE SUMMARY AND DAMAGE TOLERANCE CRITERIA RECOMMENDATIONS FOR ATTACHMENT LUGS Final Report, 3 Sep. 1980 - 30 Sep. 1984
K. Kathiresan and T. R. Brussat Wright-Patterson AFB, Ohio AFWAL Sep. 1984 72 p 5 Vol.
(Contract F33615-80-C-3211)
(AD-A151017; LG82ER0117-5; AFWAL-TR-84-3080-Vol-5) Avail: NTIS HC A04/MF A01 CSCL 01/3

This is the 5th volume of a 6 part report on a program to develop the design criteria and analytical methods necessary to ensure the damage tolerance of aircraft attachment lugs. This program consisted of seven tasks proceeding from and extensive cracking data survey and assessment of nondestructive inspection capabilities (NDI), through analysis methods development and evaluation, to the recommending of the damage tolerance design criteria for aircraft attachment lugs. Volume 1 to 4 provide: Results of the crackling data survey and nondestructive inspection capabilities assessment (Tasks 1 and 2); The developed analytical methods for predicting residual strength and crack growth behavior in attachment lugs; The results of analytical predictions (Task 4), experimental testing (Task 5) and analytical-experimental correlations (Task 6); and The tabulation of raw experimental data generated under Task 5. The volume summarizes results for the first six tasks and recommends the initial flaw requirements for damage tolerance design criteria for aircraft attachment lugs, which were developed in Task 7. Vol 6 is the user's manual for the computer program LUGRO for the prediction of crack growth behavior in attachment lugs. GRA

N85-23762# Department of the Air Force, Washington, D.C.
CARGO HANDLING SYSTEM Patent Application
M. S. Traister, inventor (to Air Force) Filed 10 Oct. 1984 25 p
(AD-D011569; US-Patent-Appl-SN-659484) Avail: NTIS HC A02/MF A01 CSCL 13/9

This patent application discloses a cargo handling system having three major components: (1) a plurality of loading jack assemblies, (2) a plurality of stationary jack assemblies, and (3) a tow bar. The loading jack assemblies are of a novel construction so as to be removably mounted upon a cargo to be loaded or unloaded from the cargo bay of an aircraft or if desired onto a flat bed trailer truck. During the loading and unloading procedure a plurality of uniquely constructed stationary jack assemblies are used in conjunction with the loading jack assemblies so as to aid in the loading and unloading operation. By use of the combination of removable loading jack assemblies and stationary jack as-

semblies, cargo can be quickly loaded and unloaded into and from a minimum of space. GRA

N85-23763# Centre d'Essais en Vol, Istres (France).
GLIDER NIMBUS 3-24.5. PARTIAL CERTIFICATION TEST RESULTS FOR IMPORTATION IN THE U CATEGORY [PLANEUR NIMBUS 3-24.5. RESULTATS D'EREUVES RESTREINTES DE CERTIFICATION POUR IMPORT EN CATEGORIE U]
13 Nov. 1984 30 p In FRENCH
(Rept-CEV/IS/SE/AV/84) Avail: NTIS HC A03/MF A01

Flight tests of a high performance glider built in glass carbon epoxy with 24.5 m wing spread are described. Tests include longitudinal control, lateral maneuverability, compensation, statical longitudinal stability and high velocity controls. Corrections necessary to allow a certification recommendation are summarized. Author (ESA)

N85-23764# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
THERMAL RESPONSE OF AIRCRAFT CABIN CEILING MATERIALS DURING A POST-CRASH, EXTERNAL FUEL-SPILL, FIRE SCENARIO
Leonard Y. Cooper Oct. 1984 53 p refs Sponsored in part by FAA
(PB85-145647; NBSIR-84/2912) Avail: NTIS HC A04/MF A01 CSCL 01B

An algorithm was developed to predict the thermal response of aircraft ceiling materials during a post-crash fire scenario. The scenario involves an aircraft's emergency exit doorway which opens directly onto the flames of an external, fuel-spill fire which engulf a large portion of the fuselage. Data of near-ceiling temperatures acquired during a series of eight, full-scale, wide-body aircraft cabin, post-crash test simulations provide indirect validation of the algorithm. These tests involved cabins outfitted with single, mockup seats. Two other full-scale cabin tests involving fire spread through twenty-one seat arrays with different types of seat construction provide the input data required to exercise the algorithm in evaluations of fully outfitted cabins. GRA

N85-23765# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
GEARS AND POWER TRANSMISSION SYSTEMS FOR HELICOPTERS AND TURBOPROPS
Loughton, England Jan. 1985 385 p refs In ENGLISH and FRENCH Conf. held in Lisbon, 8-12 Oct. 1984
(AGARD-CP-369; ISBN-92-835-0372-4) Avail: NTIS HC A17/MF A01

The Symposium was arranged in seven sessions: Review of Current Transmission Technology (4); Helicopter and Turboprop Transmission Technology Needs and Design (4); Component Design Technology and Manufacturing Considerations (8); Tribological Aspects of Transmission Components (6); Diagnostics, Measurements, and Noise (5); Problems and Failures in Gearing Applications (3); and Qualification Standards and Specifications (2). The purpose of the Symposium was to exchange and disseminate information on reasearch and development conducted on gears and transmission systems in order to introduce new technologies for improvements in weight, performance, and life-cycle costs. For individual titles, see N85-23766 through N85-23796.

N85-23766# Army Research and Technology Labs., Cleveland, Ohio. Propulsion Lab.
SUMMARY OF DRIVE-TRAIN COMPONENT TECHNOLOGY IN HELICOPTERS c07
Gilbert J. Weden and John J. Coy *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 17 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

A review of current helicopters was conducted to determine the technology in the drive train systems. The design features including reliability, maintainability and survivability characteristics, in transmission systems for the OH-58, UH-1, CH-47 and UH-60 helicopters are highlighted. In addition, trade offs involving cost, reliability and life are discussed. B.W.

N85-23767# Societe Nationale Industrielle Aerospatiale, Marignane (France). Service D'Etude des Transmissions.
CURRENT TRANSMISSION SYSTEMS [SYSTEMES DE TRANSMISSION ACTUELS] c07
R. Francois *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 12 p In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Transmissions on the new generation Ecureuil, Dauphin, and Super-Puma helicopters, produced in series by the National Industrial Aerospace Society, are described. The most significant technical options are comparatively analyzed showing progress made in the areas of safety, reliability, and the noise of reduction gears and gear boxes. The effective demonstration of safety margins is recalled as well as redundant systems for lubricating the main gear box. Simplicity of design, the use of steels, and heat treatments enhance the performance of gears and ball bearings. Consideration of the noise criteria when choosing the geometry of the gear teeth is discussed. A.R.H.

N85-23768# Imperial Coll. of Science and Technology, London (England). Tribology Section.
HELICOPTER TRANSMISSION LUBRICANTS c27
H. A. Spikes *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The problems associated with the lubrication of helicopter transmissions are outlined. Changes likely to occur over the next decade involving helicopter lubricants are discussed. For many years, helicopter reliability has suffered both in the UK and the USA from the requirement that the oil be common to both the transmission and the gas turbine. In practice, certainly in the UK, most helicopters do not, in fact, use a common oil. The UK helicopter industry is in sympathy with the logistic advantages of minimizing the number of oils stocked but feels that this could be more successfully achieved by adopting a single transmission oil for all NATO helicopters. It now appears that this is now being considered as a practical alternative on both sides of the Atlantic. In the UK, the MOD has funded the successful development of a helicopter transmission oil in anticipation of such a move. The USA after many years of being antagonistic towards separate gearbox and engine lubricants is about to embark on a relevant oil development program. B.W.

N85-23769# Boeing Vertol Co., Philadelphia, Pa.
SPECIAL POWER TRAIN REQUIREMENTS FOR THE NEXT GENERATION OF ROTARY-WING AIRCRAFT c07
Raymond J. Drago and Joseph W. Lenski, Jr. *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The omnipresent rotary wing drive system requirements for minimum weight with maximum reliability will be compounded in the future by additional restrictions on size, damage tolerance, cost, and east of assembly and maintenance. Possible approaches designed to improve the performance of rotary wing drive systems are discussed. Specific examples of extensions of current technology are given. B.W.

N85-23770# General Electric Co., Lynn, Mass. Gear Systems.
A STATE OF THE ART ASSESSMENT OF TURBOPROP TRANSMISSION TECHNOLOGY AND PROJECTED NEEDS FOR THE NEXT GENERATION c07
Robert J. Willis, Jr. *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 11 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The major share of power transmission research and develop-

ment during the past twenty years has been expended on the improvement of helicopter main rotor drives. Furtunately, most of the advanced technology features resulting from these efforts are directly applicable to turboprop transmission. The technology base is made up of a number of interacting disciplines whose application is tempered by economics as well as the engineering state of the art at any given time. Modern computers are playing an ever increasing role in the design process and promise to be the means of removing gear design from its empirical background. The utilization of state of the art technology as the framework for turboprop transmission design is discussed. B.W.

N85-23771# Pratt and Whitney Aircraft of Canada Ltd., Mississauga (Ontario).
ADVANCED GEARBOX TECHNOLOGY IN SMALL TURBO PROPELLER ENGINES c07
Cliff Brownridge and Derek Hollingworth *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Gearbox component analysis traditionally deals with the calculation of Hertzian stresses at gear contacting surfaces and the fillet stresses at the tooth bases caused by the meshing loads. Major assumptions are often made regarding the dynamic loads and the variation of loads across teeth due to misalignment. Little attention is paid to gear weight optimization, or stresses generated at complex interactions such as splines or fretting surfaces between flanges. Current 3D fe methods used to examine some of the more complex surface to surface interactions are discussed. The loading experienced between dynamically active teeth meshing at high speed is addressed. To successfully design a light weight and durable gearbox for aircraft applications complex computer modelling is necessary and new theories of failure are needed to deal with such aspects as fretting fatigue. B.W.

N85-23772# Bell Helicopter Co., Fort Worth, Tex. Transmission Design.
THE HELICOPTER TRANSMISSION DESIGN PROCESS c07
Roy Battles *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 8 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

An overview of helicopter transmission design and development is presented. Aspects from conceptualization to working production equipment are presented. They include the following six phases: (1) predesign; (2) design; (3) manufacturing coordination; (4) bench testing; (5) aircraft testing; and (6) field service support. G.L.C.

N85-23773# Centre Technique des Industries Mecaniques, Senlis (France).
SOFTWARE FOR DESIGNING TEETH FOR REDUCTION GEARS AND TRANSMISSIONS [LOGICIEL DE CONCEPTION DES DENTURES D'ENGRENAGES POUR REDUCTEURS ET BOITES DE VITESSES] c37
L. Faure and A. Borrien *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Capabilities offered by software developed by CETIM for the computer aided design of gear teeth (C.A.D.O.R.) are presented. The structure of the input program which permits the designer to rapidly obtain the optimal characteristics of a gear which must meet given specifications is presented. The combination of different programs in the software package to permit the user to assure proper gear sizing and set the tolerance for the desired precision and action is considered. Transl. by A.R.H.

N85-23774# Westland Helicopters Ltd., Yeovil (England). Tribology Research.
FINE FILTRATION: AN ATTRACTIVE ROUTE TOWARDS LOWER HELICOPTER OPERATING COSTS
P. B. Macpherson *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Helicopter transmission mechanical reliability and longevity are considered and discussed in terms of filtration of the gearbox lubricating media. The background research and trails experience that led to the adoption of vine (3 micron) filtration are discussed. It is pointed out that in order to increase longevity, and therefore lower costs, the transmission unit must begin its life in the cleanest possible state. To achieve this end, standard production methods must be revised. G.L.C.

N85-23775# Ruhr Univ., Bochum (West Germany).
LOAD CAPACITY OF CAGES OF ROLLER BEARINGS FOR PLANET WHEELS c37
F. Jarchow and P. G. Hoch *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 22 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

In planetary gears the rotation of the planet-carrier generates forces of inertia, which can cause fatigue failures of the cages in roller bearings of planet wheels. By means of computer routines forces on inertia and counter forces as well as stress resultants, nominal stresses, stress concentration factors and stress gradients are calculated for bearing cages of various design. Yield strength and fatigue strength of samples of cage material are determined experimentally, and fatigue stress diagrams for cases of different shape and material are worked out. Thus the calculated safety factors against fatigue failure are confirmed by test runs of bearings on a test bench. The results of the investigations are summed up in easily applicable charts. G.L.C.

N85-23776# Inspectorate International S.A., Neuchatel (Switzerland).
LOAD CARRYING CAPACITY OF DOUBLE CIRCULAR ARC GEARS c37
M. A. K. Fahmy and R. E. Jonckheere (Brussels Univ.) *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 12 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

An overview of some experimental and numerical investigations into several aspects of the load-carrying capacity of double circular arc (D.C.A.) gear teeth is presented. Tooth deflection and bending moment distribution were studied using three dimensional holographic interferometry, whereas rootstresses were determined by means of miniature strangers. The finite element method and finite difference method were used to determine deflections numerically. G.L.C.

N85-23777# United Technologies Corp., Stratford, Conn.
MANUFACTURING PERSPECTIVE IN THE DESIGN OF BEVEL GEARING c37
A. J. Lemanski, Harold K. Frint, and Warren D. Glasow *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 18 p ref (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

A manufacturing perspective of an advanced technique for the design and in-process inspection of spiral bevel gearing utilizing a computer controlled multi-axis coordinate measuring machine, is being developed. Both the designer and the gear manufacturing engineer will have more options in the analysis and manufacture of bevel gearing due to the positive control of the tooth profile geometry and related gear dimensions as permitted by the advanced technique. The Zeiss Model UMM 500 universal coordinate measuring machine in conjunction with an advanced Gleason G-Met software package provides for a unique interaction between the designer and the gear manufacturer that permits rapid optimization of spiral bevel tooth geometry during initial tooth form development. An advanced design/production technique for the in-process inspection and manufacture of aircraft quality spiral bevel gearing is described. The technique involves mapping of spiral teeth over their entire working surfaces and quantitatively

comparing surface normals with the nominal master gear values at some 45 grid points. In addition, this technique features a means for rapidly calculating corrective grinding machine setting changes for controlling the tooth profile geometry within specified tolerance requirements. Author

N85-23778# Spar Aerospace Products Ltd., Toronto (Ontario). Manufacturing Dept.
MANUFACTURING CONSIDERATIONS RELATED TO AIRCRAFT GEARBOXES c37
J. N. McDade and G. B. Collin *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The technology used in aircraft gearbox manufacturing, covers a whole gamut of methods, types of machining and chemical processing. While an aircraft gearbox manufacturer must aggressively ensure efficient productivity, his efforts are frequently negated by the requirements of the designer. As aircraft gear systems are required to transmit more power at greater speeds, the trend is to provide this performance with a minimum of increase in size and weight. This necessitates better dynamic capability, resulting from improvements in metallurgy, manufacturing equipment, techniques, and metrology. These improvements can be costly, it is therefore, encumbent on the designer to carefully consider his designs, the terms of producibility. This can best be one in close liaison with the manufacturing engineer. G.L.C.

N85-23779# Fiat Aviazione S.p.A., Turin (Italy). Transmission Engineering Dept.
POSSIBLE TECHNOLOGICAL ANSWERS TO NEW DESIGN REQUIREMENTS FOR POWER TRANSMISSION SYSTEMS c07
L. Battezzato and S. Turra *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 13 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

In the new projects of gearboxes for aeronautical application, the specified requirements have become more and more severe asking for continuous technology advance. The most important points put out by these specs, such as fail safety, reliability, low vibration and low noise, high working temperature, invulnerability and maintainability, of course combined with a low weight characteristic are discussed. A detailed analysis is carried out to identify the guidelines for obtaining the best compromise among the above listed requirements, by applying a proven philosophy. The advantage of a reliable system capable of detecting failures in progress within the gearbox is also underlined as it can be a key point in defining the final design resulting from the optimization procedure. G.L.C.

N85-23780# Watteeuw (M. C.) N.V., Bruges (Belgium).
CASE DEPTH ON FLANKS OF GEARS FOR HELICOPTER GEARBOXES c37
Andre Watteeuw *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 12 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

One of the most difficult and delicate operations during the manufacturing process of gears for helicopter gearboxes and aircraft gears is the heat treatment. Case hardened alloy steel of high quality are mainly used for aircraft gears. not only a good structure in the case hardened tooth but also the surface hardness, the core hardness and case depth are very important for the load capacity of these gears. On the drawing and in the specifications belonging to it, values and tolerances have been provided for the above mentioned hardnesses. These, however, are not always adequate to guarantee a good manufacture. These and other factors such as load capacity, tensile stress and pitting of gears are treated. Author

N85-23781*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSMISSION EFFICIENCY MEASUREMENTS AND CORRELATIONS WITH PHYSICAL CHARACTERISTICS OF THE LUBRICANT c27
John J. Coy, Andrew M. Mitchell, and Bernard J. Hamrock *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p refs Previously announced as N84-30293 Prepared in cooperation with Army Research and Technology Labs. (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01 CSCL 11G

Data from helicopter transmission efficiency tests were compared to physical properties of the eleven lubricants used in those tests. The tests were conducted with the OH-58 helicopter main rotor transmission. Efficiencies ranged from 98.3 to 98.8 percent. The data was examined for correlation of physical properties with efficiency. There was a reasonable correlation of efficiency with absolute viscosity if the viscosity was first corrected for temperature and pressure in the lubricated contact. Between lubricants, efficiency did not correlate well with viscosity at atmospheric pressure. Between lubricants, efficiency did not correlate well with calculated lubricant film forming capacity. Bench type sliding friction and wear measurements could not be correlated to transmission efficiency and component wear. Author

N85-23782# Imperial Coll. of Science and Technology, London (England). Tribology Section.
THE CHARACTERISTICS OF SURFACE ROUGHNESS IMPORTANT TO GEAR AND ROLLING BEARING PROBLEMS c37
R. S. Sayles and M. N. Webster *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The role of surface roughness in rolling and rolling and sliding contacts is examined in the light of present concepts and ideas. Examples of the influence of roughness, and the important characteristics of this roughness, are drawn from helicopter transmission and rolling bearing research. The important influence of geometry and roughness in tribological problems is accepted and only limited progress is made in understanding the exact mechanisms involved and incorporating this knowledge into surface finishing processes designed to improve performance. An approach to surface topography measurement and analysis which allows many of these problems to be examined in great detail is presented. Examples of the approach are presented for several tribological problems including dimensional tolerance, rolling contact noise, and fatigue life, and in each case the character of the important range and size of surface roughness features is identified in terms of its influence on the specific problem under examination. Author

N85-23783# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Lab. de Mecanique des Contacts.
SIGNIFICANT PARAMETERS OF THE BEHAVIOR AND OF THE SURFACE DAMAGE OF THE LUBRICATED HERTZIAN CONTACT: AN APPLICATION TO GEARS [PARAMETRES SIGNIFICATIFS DU COMPORTEMENT ET DES AVARIES DE SURFACE DU CONTACT HERTZIEN LUBRIFIE, APPLICATION AUX ENGRENAGES] c37
D. Berthe and L. Flamand *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 13 p refs In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The life of a mechanism is often limited by surface damages. Some criteria are given for estimating the severity of the working of the lubricated Hertzian contact and the risk of surface damage. Three classes of surface damage in heavly loaded lubricated contacts are specified. Theoretical models used to analyze the mechanical behavior and the identify to parameters of contact operation are defined and the importance of the scale factor is noted. The application of the analysis method to problems of gear teeth surface damage is discussed. Transl. by A.R.H.

N85-23784# Pisa Univ. (Italy).
PROBLEMS OF ELASTIC HYDRODYNAMIC LUBRICATION OF HELICOPTER TRANSMISSION GEARS c27

Dino Dini *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 9 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The reduction gear box and its components, from the engine to the main and tail rotors, contain epicyclic and bevel reduction gears, as taper thrust and cylindrical roller bearing, subjected to elasto-hydro-dynamic lubrication whose operation needs a better understanding in order to improve present efficiency. Since the lubrication efficiency is depending upon the elastic deformation of the contact surfaces, a theory for a better physical interpretation of the mechanism is discussed as a design means to alleviate adverse stress conditions during operations. An attempt to solve the problem of computing the pressure distribution in the contact is made and, at the same time, of allowing for the effects that this pressure has on the properties of the fluid and on the geometry of the elastic solids. The solution also provides the shape of the lubricant film, particularly the minimum clearance between the solids. An experimental high performance equipment capable to simulate the behaviour of Hertzian contacts in elasto-hydro-dynamic lubrication is proposed. Author

N85-23785# Army Research Office, Research Triangle Park, N. C. Solid Mechanics Branch.
CHEMICAL-MECHANICAL INTERACTION IN GEARS c27
Edward Saibel *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 8 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

A theory of chemo-mechanical interaction is developed to explain several disparate phenomena in the field of tribology on a quantitative basis. The important new quantity in this theory is the variation of the Gibbs chemical potential with stress, a quantity formulated and calculated explicitly using statistical thermodynamics and many-body theory, called the chemo-stress coefficient. The theory gives the basis for quantitative explanation of stress corrosion, fretting corrosion, the Rehbinder effect, and enhanced chemical activity on solid surfaces. In particular it suggests methods of arresting corrosion by controlling the charge distribution of electrolytes near the surface of the solid. A mechanism for pitting corrosion observed on lubricated load bearing surfaces of mechanical components such as gears is proposed. This theory emphasizes the importance of specific ions in the lubricant which migrate to the tips of cracks and diffuse through near-surface layers of the metal thereby causing volumetric changes leading to blistering or pitting. Author

N85-23786# Ecole Centrale de Lyon (France). Lab. de Technologie des Surfaces.
WEAR REDUCTION BY LUBRICANTS IN CONFINED CONTACTS [REDUCTION DE L'USURE PAR LES LUBRIFIANTS DANS LES CONTACTS ETROITE] c27
Ph. Kapsa and M. Belin *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 11 p refs In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The presence of a lubricant and its chemical activity are important parameters in the sliding friction behavior and wear of solids by relative displacement. In the case of transmission gears, the contact between the two solids is of the Hertzian type and friction is then produced in the absence of a thick oil film; the lubrication is mixed or limited elastohydrodynamic. In lubrication regimes where solid-solid contacts exist, wear reduction takes place by the formation of a thin solid film adhering to the sliding surface, created by a chemical reaction under the effect of sliding. Results of tests in the presence of anti-wear additives (dithiophosphate of zinc and tricresylphosphate) show the importance of wear on the kinetics of formation of these films. The apparent pressure of the contant and the sliding velocity not modify the elementary phenomena of war but do play a proponderant role in the total wear of surfaces. Transl. by A.R.H.

N85-23787# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ROOT STRESSES IN CONFORMAL GEARS-STRAIN GAUGE AND PHOTOELASTIC INVESTIGATIONS c39
D. G. Astridge, B. R. Reason, and D. Bathe *In its* Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The significant amount of analytical work on strong gear tooth forms carried out since the classical papers of Shotter et al are reviewed, and the results of a project which addresses a problem common to all three-dimensional photoelastic studies of root stresses in gears are presented an accurate delination of the contact conjunction geometry throughout the stress freezing cycle is the common problem. Photoelastic model results are compared with those measured by strain gauge methods on the definitive gears. Author

N85-23788# Kaman Aerospace Corp., Bloomfield, Conn.
TRANSMISSION OF GEAR NOISE TO AIRCRAFT INTERIORS PREDICTION METHODS c71
Alex Berman *In* GARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 7 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Prediction of interior noise of helicopters due to drive train vibration ideally requires an analytical model of the entire dynamic system including airframe, transmission, and all attachments. The development of such a model is beset with numerous difficulties. The need for such model is addressed, as is certain of the critical issues involved: the inadequacy of finite element modeling in the acoustic frequency range; the costs associated with assessment of parametric variations; the difficulty of incorporating new technology into existing computer programs. Potential solutions to these problems are discussed: use of combined test and analysis (system identification) to obtain better models; component synthesis using frequency domain reduced models; a computer program known as DYSCO. This program has a general capability to modify and couple components in the time or frequency domain and can act as a repository for the latest analytical developments. Author

N85-23789# Fiat Aviazione S.p.A., Turin (Italy). Direzione Progettazione.
EVOLUTION OF THE DESIGN TECHNIQUES FOR HELICOPTER MAIN TRANSMISSION GEARBOXES c07
G. Bensi and L. Tarricone *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The evolution of the design techniques are shown which were adopted in FIAT AVIAZIONE for the helicopters main transmission gearboxes by means of the description of the mechanical units designed for the AEROSPATIALE helicopters: SA 321, SA 330, SA 360, SA 365. The technical solutions have followed a development strictly related to the customer required specifications. Considering the past and present evolution we can foresee the future development trend. As an explanatory example, an advanced main transmission gearbox for a medium twin engined helicopter is considered and some design solutions are shown. Evaluations of four gearbox configurations were carried out by assigning the right importance coefficient to three appreciation functions: reliability, cost and weight. Author

N85-23790# Naval Aircraft Materials Lab., Fleetlands (England).
CONDITION MONITORING OF HELICOPTER GEARBOXES USING AUTOMATIC VIBRATION ANALYSIS TECHNIQUES c07
P. Gadd and P. J. Mithcell (MOD Navy) *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Methods using enhanced signal averaging techniques were developed to give early warning of the onset of a variety of gearbox

failures. Prototype analysis equipment was developed and tested which will permit the condition of components within helicopter dynamic systems (rotors, gearboxes, and powerplants) to be established. Arrangements for data collection in flight and during ground runs are described. The signal processing methods, including the automatic techniques for secondary analysis which enable defined features to be extracted from the basic signatures, are discussed. Examples are given of the extent to which damage or malfunction of various internal components can be discerned by the techniques employed. The question of application to the widely dispersed fleet of naval aircraft is considered, and the prospects for achieving full on-condition maintenance of in-service gearboxes is assessed. Author

N85-23791# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
GEAR NOISE ORIGINS **c71**
William D. Mark *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Each pair of meshing gears in a transmission gives rise to a source of vibratory excitation that can result in the radiation of sound. Each such source is most conveniently characterized as a displacement form of excitation generally referred to as the static transmission error of the gear pair. Contributions to the frequency spectrum of the static transmission error of spur and helical gears arising from tooth and gear body elastic deformations and from deviations of tooth surfaces from perfect involute surfaces are considered. Tooth surface deviations are decomposed into contributions giving rise to tooth meshing harmonic excitations and rotational harmonic or sideband excitations. Various types of gear tooth errors are defined and the contributions of these errors to different parts of the frequency spectrum are described. The attenuating effect on the static transmission error spectrum arising from the smoothing action of multiple tooth contact is explained. Author

N85-23792# Westland Helicopters Ltd., Yeovil (England). D.C. M.D. Transmissions.
THE OBSERVATION AND INTERPRETATION OF GEAR TOOTH FAILURES **c38**
B. A. Shotter *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 13 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Progress in transmission reliability can only come from a full understunding of what causes the limitation of tooth load carrying capacity. The many aspects of tooth failure, the significance of various initiation areas, possible approaches to improve the critical areas and other relevant factors are discussed. Author

N85-23793# CEMUL, Lisbon (Portugal).
PROBLEMS REGARDING THE PRACTICAL EVALUATION OF EFFICIENCY OF WORM GEARS **c37**
F. A. P. DaSilva *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 2 p refs (For primary document see N85-23765 14-31)
Avail: NTIS HC A17/MF A01

Worm gears are often used in industry or domestic application (lifts) when a high transmission is required in a limited space, which prevents the option for multiple gear trains. Negative aspects of these gears are the complex geometry and high values of sliding during contact leading to low values of efficiency. For the other types of gear, spur, bevel and conical ones values are usually higher than 90% but in this case practical values of 50% may result. It is possible according to the choosen geometry to forecast the efficiency theoretically. However the lubricant behavior is generally defined by a parameter, sometimes designated as lubricant factor, which is very difficult to ascertain with sufficient accuracy. Considerations regarding the practical determination of this factor and suggestions for testing are presented for discussion. Author

N85-23794# Cambridge Univ. (England). Dept. of Engineering.
TRANSMISSION ERROR MEASUREMENTS IN GEARBOX DEVELOPMENT **c37**
J. D. Smith *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 5 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

There is a requirement to test gears for initial development, for production monitoring and for condition monitoring in service. Traditionally the first two were carried out by a combination of profile, helix, pitch and bedding checks and the third by measuring vibration at bearing housings. Gear drives in aircraft applications present difficulties in checking due to high distortions in the light weight gear cases. The use of transmission error (single flank) checking can give useful information on accuracy of alignment in gearboxes as well as fundamental noise generation information. Problems arise with attempts to use grating systems in turboprops but helicopters have tooth frequencies in a suitable range. Author

N85-23795# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Helicopter and Military Aircraft Group.
DO NEW AIRCRAFT NEED NEW TECHNOLOGIES AND CERTIFICATION RULES?
Joachim Harmann and Wolfgang Jonda *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 7 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

Using the example of development steps, a transmission usable for a 2 ton dual engined multipurpose helicopter demonstrates that technologies could drastically improve this product within approximately 15 years. Technologies which will influence the design are: improved manufacturing; use of computer calculation methods; testing procedure knowledge; diagnosis systems; and materials. The overall layout for the available engine power will change. To avoid unnecessary disadvantages the certification rules should be updated. The optimum benefits will be achieved when the certification rules are standardized for all counties in the Western World. B.G.

N85-23796# Federal Aviation Administration, Des Plaines, Ill. Propulsion Branch.
ESTABLISHMENT AND MAINTENANCE OF CERTIFICATION STANDARDS FOR HELICOPTER AND TURBOPROP POWER TRANSMISSION SYSTEMS
Harold W. Ferris *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 7 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

The procedures used by the Federal Aviation Administration (FAA) to develop qualification/certification safety standards for helicopter and engine turboprop drive systems are discussed. The rules are always generated in coordination with industry for a minimum of economic impact, and are worded to promote design innovation while maintaining adequate safety. The rules are periodically updated to account for service experience and advancements in the state-of-the-art. A survey of the applicable Federal Aviation Regulations (FAR's) explains how all safety aspects of a new drive system are covered during the initial certification program. The FAR's also provide for continued airworthiness, as service experience is accumulated, such that inspection intervals may be increased to on condition, or decreased, if service diffulties indicate that an area of redesign is required. As further testing continues, initial limitations on component replacement times are relaxed until operating costs decrease to a minimum as the design reaches maturity. The FAA role is to assist industry in the promotion of aviation without compromising safety. Author

N85-23691# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER ON CIVIL AVIATION FUEL CONSERVATION EFFORTS
I. Mashkivskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 10-14 Transl. into ENGLISH

from Vozdushnyy Transport (Moscow), 22 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

N85-24104# Joint Publications Research Service, Arlington, Va.
SOME OPTIMIZATION PROBLEMS IN STATIC AEROELASTICITY FOR WINGS MADE OF COMPOSITE MATERIALS Abstract Only
N. V. Banichuk and S. Yu. Ivanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 69-70 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 3, Mar. 1983 p 21-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24121# Joint Publications Research Service, Arlington, Va.
APPROXIMATE ANALYTIC METHOD OF CALCULATING TRAJECTORIES OF MOVEMENT OF A FLIGHT VEHICLE IN THE ATMOSPHERE Abstract Only
N. M. Ivanov, A. I. Martynov, and N. L. Sokolov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 80 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 348-452 Original language document was announced in IAA as A83-32364 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24158# Joint Publications Research Service, Arlington, Va.
SELECTION OF EFFECTIVE ARRANGEMENT OF HEAVY UNDERCARRIAGE SYSTEMS FOR USE WITH CONCRETE RUNWAYS Abstract Only
T. M. Avdyukhina *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 1 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 83-85 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24159# Joint Publications Research Service, Arlington, Va.
DURABILITY CALCULATION OF WING PANEL ELEMENT Abstract Only
A. V. Kirillov and A. S. Mostovoy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 1-2 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 12, Dec. 1983 p 32-26 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24176# Joint Publications Research Service, Arlington, Va.
AUTOMATING THE STUDY OF ERROR IN DISCRETE AERODYNAMIC FAIRING DESIGN Abstract Only
I. I. Itskovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 41-42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 28-33 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24425# Joint Publications Research Service, Arlington, Va.
MI-8 HELICOPTER CARGO LOADING EXPERIMENT FOR ARCTIC SHIPPING Abstract Only
S. Omelchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 3 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 18 Oct. 1984 p 4 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-23797*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REMOTE CONTROL OF AN IMPACT DEMONSTRATION VEHICLE
Paul F. Harney, James B. Craft, Jr., and Richard G. Johnson Apr. 1985 12 p refs Presented at 31st Intern. Instrumentation Symp. of the Instrument Soc. of Am., San Diego, Calif., 6-9 May 1985
(NASA-TM-85925; H-1282; NAS 1.15:85925; Paper-542) Avail: NTIS HC A02/MF A01 CSCL 01D

Uplink and downlink telemetry systems were installed in a Boeing 720 aircraft that was remotely flown from Rogers Dry Lake at Edwards Air Force Base and impacted into a designated crash site on the lake bed. The controlled impact demonstration (CID) program was a joint venture by the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA) to test passenger survivability using antimisting kerosene (AMK) to inhibit postcrash fires, improve passenger seats and restraints, and improve fire-retardent materials. The uplink telemetry system was used to remotely control the aircraft and activate onboard systems from takeoff until after impact. Aircraft systems for remote control, aircraft structural response, passenger seat and restraint systems, and anthropomorphic dummy responses were recorded and displayed by the downlink stems. The instrumentation uplink and downlink systems are described. Author

N85-23798# Advisory Group for Aerospace Research and Development, Paris (France). Avionics Panel.
DESIGN FOR TACTICAL AVIONICS MAINTAINABILITY, TECHNICAL EVALUATION REPORT
B. L. Dove, ed. and J. B. Clary, ed. Oct. 1984 13 p
(AGARD-AR-204) Avail: NTIS HC A02/MF A01

The inherent logical makeup of digital systems presents the opportunity for improving the maintainability of complex avionic systems. While there was limited success in the early use of Built-In-Self-Test and Built-In-Test (BIST/BIT), higher levels of circuit integration now offer even greater opportunities and challenges to avionic systems designers. However, while past and current digital systems designs have BIST/BIT as an add-on feature, future avionic system designs must be designed for maintainability. Recently, improved techniques and tools to support design for maintainability have become available to avionics systems designers. If used appropriately, these new approaches can lead to dramatic improvements in avionic systems maintainability. Advanced methods and tools to support design for avionic maintainability are discussed. Since modern avionic systems consist of programmable processors, both hardware and software design for maintainability issues and approaches were discussed. B.W.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-23799*# National Aeronautics and Space Administration, Washington, D. C.
WELCOME TO THE SACLAY PROPELLER TESTING CENTER
Apr. 1985 22 p Transl. into ENGLISH of the book "Bienvenue au Centre d'Essais des Propulseurs de Saclay" Saclay, France, Saclay Propeller Testing Center, 1977 p 1-15 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77648; NAS 1.15:77648) Avail: NTIS HC A02/MF A01 CSCL 01C

The history, organization, purpose, and activities of the Saclay

Propeller Testing Center is described. A list is provided of all facilities, current and planned, and the types of tests done in each facility are summarized. E.A.K.

N85-23766# Army Research and Technology Labs., Cleveland, Ohio. Propulsion Lab.
SUMMARY OF DRIVE-TRAIN COMPONENT TECHNOLOGY IN HELICOPTERS
Gilbert J. Weden and John J. Coy *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 17 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23767# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Service D'Etude des Transmissions.
CURRENT TRANSMISSION SYSTEMS [SYSTEMES DE TRANSMISSION ACTUELS]
R. Francois *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 12 p In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23769# Boeing Vertol Co., Philadelphia, Pa.
SPECIAL POWER TRAIN REQUIREMENTS FOR THE NEXT GENERATION OF ROTARY-WING AIRCRAFT
Raymond J. Drago and Joseph W. Lenski, Jr. *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23770# General Electric Co., Lynn, Mass. Gear Systems.
A STATE OF THE ART ASSESSMENT OF TURBOPROP TRANSMISSION TECHNOLOGY AND PROJECTED NEEDS FOR THE NEXT GENERATION
Robert J. Willis, Jr. *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 11 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23771# Pratt and Whitney Aircraft of Canada Ltd., Mississauga (Ontario).
ADVANCED GEARBOX TECHNOLOGY IN SMALL TURBO PROPELLER ENGINES
Cliff Brownridge and Derek Hollingworth *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23772# Bell Helicopter Co., Fort Worth, Tex. Transmission Design.
THE HELICOPTER TRANSMISSION DESIGN PROCESS
Roy Battles *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 8 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23779# Fiat Aviazione S.p.A., Turin (Italy). Transmission Engineering Dept.
POSSIBLE TECHNOLOGICAL ANSWERS TO NEW DESIGN REQUIREMENTS FOR POWER TRANSMISSION SYSTEMS
L. Battezzato and S. Turra *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 13 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23789# Fiat Aviazione S.p.A., Turin (Italy). Direzione Progettazione.
EVOLUTION OF THE DESIGN TECHNIQUES FOR HELICOPTER MAIN TRANSMISSION GEARBOXES
G. Bensi and L. Tarricone *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23790# Naval Aircraft Materials Lab., Fleetlands (England).
CONDITION MONITORING OF HELICOPTER GEARBOXES USING AUTOMATIC VIBRATION ANALYSIS TECHNIQUES
P. Gadd and P. J. Mithcell (MOD Navy) *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-23800*# Old Dominion Univ., Norfolk, Va. Dept. of Electrical Engineering.
DESIGN OF MULTIVARIABLE FEEDBACK CONTROL SYSTEMS VIA SPECTRAL ASSIGNMENT USING REDUCED-ORDER MODELS AND REDUCED-ORDER OBSERVERS Final Report, Oct. 1982 - Apr. 1984
Roland R. Mielke, Leonard J. Tung, and Preston Ivanhoe Carraway, III Washington NASA Apr. 1985 147 p refs
(Grant NsG-1650)
(NASA-CR-3889; NAS 1.26:3889) Avail: NTIS HC A07/MF A01

The feasibility of using reduced order models and reduced order observers with eigenvalue/eigenvector assignment procedures is investigated. A review of spectral assignment synthesis procedures is presented. Then, a reduced order model which retains essential system characteristics is formulated. A constant state feedback matrix which assigns desired closed loop eigenvalues and approximates specified closed loop eigenvectors is calculated for the reduced order model. It is shown that the eigenvalue and eigenvector assignments made in the reduced order system are retained when the feedback matrix is implemented about the full order system. In addition, those modes and associated eigenvectors which are not included in the reduced order model remain unchanged in the closed loop full order system. The fulll state feedback design is then implemented by using a reduced order observer. It is shown that the eigenvalue and eigenvector assignments of the closed loop full order system remain unchanged when a reduced order observer is used. The design procedure is illustrated by an actual design problem. Author

N85-23801*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TOTAL ENERGY-RATE FEEDBACK FOR AUTOMATIC GLIDE-SLOPE TRACKING DURING WIND-SHEAR PENETRATION
Christine M. Belcastro and Aaron J. Ostroff May 1984 73 p refs
(NASA-TP-2412; L-15845; NAS 1.60:2412) Avail: NTIS HC A04/MF A01 CSCL 01C

Low-altitude wind shear is recognized as an infrequent but significant hazard to all aircraft during the take-off and landing phases of flight. A total energy-rate sensor was developed for measuring the specific total energy rate of an airplane with respect to the air mass. Control-system designs, both with and without energy-rate feedback, for the approach to landing of a transport airplane through a severe-wind-shear and gust environment are presented in order to evaluate this application of the sensor. A system model incorporates wind-shear-dynamics equations with the airplane equations of motion to permit analysis of the control systems under various wind-shear conditions. The control systems are designed using optimal-output feedback and are analyzed using frequency-domain control-theory techniques. Control-system performance is evaluated using a complete nonlinear simulation of the airplane combined with a severe-wind-shear and gust data package. This evaluation is concerned with control system stability and regulation capability only. A.R.H.

N85-23802# Boston Univ., Mass. Center for Computational and Applied Dynamics.

FLUTTER TAMING: A NEW TOOL FOR THE AEROELASTIC DESIGNER Final Report, 1 Apr. 1983 - 30 Apr. 1984
L. Morino Jun. 1984 77 p
(Grant AF-AFOSR-0163-83)
(AD-A150834; CCAD-TR-84-01; AFOSR-85-0140TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

A new concept for the design of aeroservoelastic systems is introduced: flutter taming by nonlinear control, i.e., use of nonlinear terms in the equation to ensure that the behavior of the system beyond the flutter speed is of benign rather than destructive nature. This is accomplished by using a very simple nonlinear control law. It is shown (using a singular perturbation analysis about the stability boundary) that flutter taming is always possible for an aeroservoelastic system that can be represented by a system of nonlinear differential equations with analytical nonlinearities. It is important to emphasize that the control system for flutter taming is fully nonlinear, and therefore it does not affect the linear behavior (in particular the stability characteristics) of the system. Hence, flutter taming can be used in conjunction with flutter supression by active control to increase the flutter speed). Applications of the theory to the case of an airfoil in supersonic flow are presented. In addition to an active control modification (use of control surface with nonlinear feedback), passive modifications (e.g., a nonlinear damper) are also investigated. GRA

N85-23803# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
[ACTIVITIES IN FLIGHT MECHANICS AND FLIGHT CONTROL] Annual Report, 1984 [FORSCHUNGSBEREICH FLUGMECHANIK/FLUGFUEHRUNG. WISSENSCHAFTLICHER BEREICHT STAND 1984]
1984 104 p refs In GERMAN Original contains color illustrations
(ISSN-0720-7808) Avail: NTIS HC A06/MF A01

Flight mechanics; real time and in flight simulation techniques; mathematical methods and data techniques; flight test instrumentation; flight control human engineering and simulation; automatic guidance and control systems; gyroscopic techniques and inertial navigation; communication processing and radio navigation; flight path tracking; aircraft radio and flight data techniques; flight medicine; and pilotless vehicles are discussed. Author (ESA)

N85-24186# Joint Publications Research Service, Arlington, Va.
A 320 TO HAVE COMBINED AUTOMATIC PILOT, FLIGHT CONTROL SYSTEM
H. Prandenc *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 51-52 refs (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-23804*# Applied Cryogenics and Materials Consultants, New Castle, Del.
TECHNOLOGY FOR PRESSURE-INSTRUMENTED THIN AIRFOIL MODELS, PHASE 1 Final Report
David A. Wigley Washington NASA May 1985 56 p
(Contract NAS1-17571)
(NASA-CR-3891; NAS 1.26:3891) Avail: NTIS HC A04/MF A01 CSCL 14B

A network of channels was chemically milled into one surface of a pair of matched plates having bond planes which were neither planar or profiled to match the contour of the trailing edge of a supercritical airfoil for testing in cryogenic wind tunnels. Vacuum brazing bonded the plates together to create a network of pressure passages without blockages or cross leaks. The greatest success was achieved with the smaller samples and planar bonding surfaces. In larger samples, problems were encountered due to warpage created by the relief of residual stresses. Successful bonds were formed by brazing A286, Nitronic 40 and 300 series stainless steels at 1065 C using AMS 4777B brazing alloy, but excessive grain growth occurred in samples of 200 grade 18 nickel maraging steels. Good bonds were obtained with maraging steel using a 47 percent Nickel-47 percent Palladium-6 percent Silicon alloy and brazing at 927 C. Electro-Discharge-Machining was an effective method of cutting profiled bond planes and airfoil contours. Orifices of good definition were obtained when the EDM wire cut passed through predrilled holes. Possible configurations for joints between small segments and the larger main wing were also studied.
A.R.H.

N85-23805*# National Aeronautics and Space Administration, Washington, D. C.
QUALIFICATION OF THE T2 WIND TUNNEL IN CRYOGENIC OPERATION. A: THERMAL FIELD, PRELIMINARY STUDY OF A SCHEMATIC MODEL
J. B. Dor, A. Mignosi, and M. Plazanet Dec. 1984 117 p refs Transl. into ENGLISH of "Qualification de la Soufflerie T2 en Fonctionnement Cryogenique. A: Champ Thermique, Etude Preliminarie d'une Maquette Schematique" rept. OA-24/5006 ONERA, Toulouse, Aug. 1982 p 1-52 Transl. by The Corporate Word Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77781; NAS 1.15:77781; OA-24/5006-Pt-A) Avail: NTIS HC A06/MF A01 CSCL 14B

The T2 wind tunnel is described. The process of generating a cyrogenic gust using the example of a test made at very low temperature is presented. Detailed results of tests on temperatures for flow in the settling chamber, the interior walls of the system, and the metal casing are given. The transverse temperature distribution in the settling chamber and working section, and of the thermal gradients in the walls, are given as a function of the temperature level of the test. Author

N85-23806*# National Aeronautics and Space Administration, Washington, D. C.
QUALIFICATION OF THE T2 WIND TUNNEL IN CRYOGENIC OPERATION. B: FLOW FLUCTUATIONS, PARTICLE DETECTION AND QUALIFICATION
J. B. Dor, A. Mignosi, and M. Plazanet Dec. 1984 84 p refs Transl. into ENGLISH of "Qualification de la Soufflerie T2 en Fonctionnement Cryogenique. B: Fluctuations de l'Ecoulement, Detection et Qualification de Particules" rept. OA-25/5006 ONERA, Toulouse, Sept. 1983 p 1-39 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77782; NAS 1.15:77782; OA-25/5006-Pt-B) Avail: NTIS HC A05/MF A01 CSCL 14B

This report presents part of the tests for verification of the T2 transonic induction wind tunnel in cryogenic operation. The first part of the results presented concerns fluctuations in pressure and temperature at ambient temperature and in cryogenic regulation. The second part presents the condensation phenomena which could be observed in the cryogenic flow by means of an optical particle detection system in the test section. Author

N85-23807*# R and D Associates, Marina Del Rey, Calif.
JESS FACILITY MODIFICATION AND ENVIRONMENTAL/POWER PLANS Final Report
T. Austin Bordeaux Jun. 1984 30 p Prepared for JPL
(Contract JPL-956885)
(NASA-CR-175685; JPL-9950-1047; NAS 1.26:175685; RDA-TR-187400-003) Avail: NTIS HC A03/MF A01 CSCL 14B

Preliminary plans for facility modifications and environmental/power systems for the JESS (Joint Exercise Support System) computer laboratory and Freedom Hall are presented. Blueprints

are provided for each of the facilities and an estimate of the air conditioning requirements is given. M.G.

N85-23808*# Southeast Basin Inter-Agency Committee, Atlanta, Ga. Dept. of Aeronautics and Astronautics.
A PRELIMINARY INVESTIGATION OF THE DYNAMIC FORCE-CALIBRATION OF A MAGNETIC SUSPENSION AND BALANCE SYSTEM Contractor Report, Jun. 1983 - Jan. 1984
M. J. Goodyer May 1985 14 p
(Grant NsG-7523)
(NASA-CR-172580; NAS 1.26:172580) Avail: NTIS HC A02/MF A01 CSCL 14B

The aerodynamic forces and moments acting upon a magnetically suspended wind tunnel model are derived from calibrations of suspension electro magnet currents against known forces. As an alternative to the conventional calibration method of applying steady forces to the model, early experiences with dynamic calibration are outlined, that is a calibration obtained by oscillating a model in suspension and deriving a force/current relationship from its inertia force and the unsteady components of currents. Advantages of dynamic calibration are speed and simplicity. The two methods of calibration applied to one force component show good agreement. Author

N85-23809# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
SIX-INCH HYGE VERTICAL IMPACT FACILITY Final Report, 1976 - 1978
J. A. Brown and F. D. Dodge Aug. 1984 65 p
(AD-A150665; AD-E801087; AFAMRL-TR-84-039) Avail: NTIS HC A04/MF A01 CSCL 13/7

The AFAMRL vertical impact facility is used to conduct research and development efforts in the areas of ejection safety, crashworthiness, and impact injury protection. The facility assembly consists of a pneumatic-hydraulic actuator, a 20 foot rail system, specimen carriage, and several support elements complemented by instrumentation and data reduction systems. This report describes the operating principles of the impact facility, and illustrations of actuator configurations, acceleration and deceleration metering pins. Carriage specimen-mounting pattern and specimen weight limits are provided. Accelerometers, data transmission, signal conditioning, and data recording are documented along with the timing control which coordinates the activation and collection of the electrical, electronic and motion picture photographic coverage. Elements in the operation of the facility operator's and safety monitor's stations during automatic control or manual test mode are discussed. Maintenance aspects are also discussed. The appendices include operating instructions and safety precautions for each of the operators during set-up and operation of the test facility. GRA

N85-23810# Canyon Research Group, Inc., Westlake Village, Calif.
VISUAL SIMULATION REQUIREMENTS FOR AIRCRAFT ASPECT RECOGNITION AT REAL WORLD DISTANCES Final Interim Report, 1 Sep. 1981 - 31 Aug. 1984
R. S. Kennedy, K. S. Berbaum, S. C. Collyer, J. G. May, and W. P. Dunlap Dec. 1984 73 p
(Contract N61339-81-C-0105)
(AD-A151040; NAVTRAEQUIPC-81-C-0105-5) Avail: NTIS HC A04/MF A01 CSCL 06/16

A research program is underway whose goal is to provide engineering guidelines on target image sufficiency for training tactics and maneuvering skills in ground-based flight simulators. The experiment examined aspect recognition sensitivity, i.e., the distance at which subjects could determine the orientation of another aircraft. The aspect recognition task was simplified in the following ways: (1) only 16 stationary targets orientations of a TA4J aircraft were presented; (2) targets had essentially the same length/width ratio; (3) subjects made binary up/down judgements; and (4) a staircase method provided percent detection thresholds for aspect recognition range. In Phase 1, four different target luminances and three background luminances were combined with four different levels of projector resolution in a partial parametric study to access the relative effects of contrast, resolution, and brightness on aspect recognition. In Phase 2, motion and direction of view were varied. Phase 3 replicated Phase I to determine whether sequence effects occurred in this repeated measures study. Through a series of ministudies, Phase 4 examined subsidiary effects (viz., different aircraft, different perceptual judgements, difficulty level of the silhouette stimuli, and poorer resolution). GRA

N85-23692# Joint Publications Research Service, Arlington, Va.
DEPUTY MINISTER ON CIVIL AVIATION CONSTRUCTION PROJECTS
V. Belikov *In its* USSR Rept.: Transportation (JPRS-UTR-85-005) 25 Mar. 1985 p 15-16 Transl. into ENGLISH from Izv. (Moscow), 23 Jan. 1985 p 2 (For primary document see N85-23688 14-01)
Avail: NTIS HC A05/MF A01

N85-24143# Joint Publications Research Service, Arlington, Va.
HARBIN'S SUBSONIC, TRANSONIC WIND TUNNEL DETAILED
Wang Ruifu and Fan Jiechuan *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 36-40 Transl. into ENGLISH from Guoji Hangkong (Peking), no. 8, 5 Aug. 1983 p 6-7 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-23811*# National Aeronautics and Space Administration, Washington, D. C.
MATERIAL RESEARCH IN MICROGRAVITY
Dieter Langbein Dec. 1984 45 p Transl. into ENGLISH from Spektrum der Wissenschaft (West Germany), Apr. 1984 p 28-42 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77628; NAS 1.15:77628) Avail: NTIS HC A03/MF A01 CSCL 22A

A popular discussion is given of microgravity effects in engineering and medicine gained from Skylab experience. Areas covered include crystal growing, liquid surface properties, diffusion, ferromagnetism, and emulsions. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-24756 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
OPTIMAL SPACE TRAJECTORIES [TRAJECTOIRES SPATIALES OPTIMALES]
J. P. Marec *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 77-95 refs In FRENCH Original language document was announced in IAA as A84-37529 (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24763 Centre National d'Etudes Spatiales, Toulouse (France).
ORBIT PERTURBATION. EXTRAPOLATION OF PERTURBED ORBITS [PERTURBATIONS D'ORBITES. EXTRAPOLATION D'ORBITES PERTURBEES]
O. Zarrouati *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 267-439 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24764 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherches de Geodesie Spatiale.

POTENTIAL MODELS [MODELS DE POTENTIAL]
G. Balmino *In its* Space Math. for the Prepn. and the Develo. of Satellite Exploit. 1984 p 441-467 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24765 Centre National d'Etudes Spatiales, Toulouse (France).
ORBIT RECONSTITUTION [RESTITUTION D'ORBITE]
D. Zobler *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 469-499 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24767 Centre National d'Etudes Spatiales, Toulouse (France).
ATTITUDE MEASUREMENTS AND DETERMINATION [MESURES ET RESTITUTION D'ATTITUDE]
J. Foliard *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 537-590 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24768 Institut Geographique National, Paris (France).
LOCATION AND SYNCHRONIZATION [LOCALISATION ET SYNCHRONISATION]
C. LeCocq *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 591-611 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24772 Centre National d'Etudes Spatiales, Toulouse (France).
ORBITAL POSITIONING AND STATIONKEEPING OF GEOSTATIONARY SATELLITES [MISE ET MAINTIEN A POSTE DES SATELLITES GEOSTATIONNAIRES]
H. Donat *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 673-746 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24784 Institut Geographique National, Paris (France).
REFERENCE SYSTEMS [LES SYSTEMES DE REFERENCE]
C. Boucher *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1073-1092 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-23812 Columbia Univ., New York.
ONBOARD DEMAND SCHEDULING OF A MULTIBEAM SS/TDMA SATELLITE WITH INTEGRATED CIRCUIT AND PACKET SWITCHING Ph.D. Thesis
Amalie Julianna Frank 1984 287 p
Avail: Univ. Microfilms Order No. DA8427390

A spacecraft switched time division multiple access communications satellite system is investigated. It achieves efficient bandwidth and system utilization by frequency reuse with multibeams, by integrated circuit and packet switching, and by onboard demand scheduling of beam interconnections on a frame-by-frame basis. An aim is to formulate a scheduling strategy that yields high utilization, subject to achieving acceptable levels of circuit blocking and packet queueing delay, and that is suitable for onboard use by meeting given time and complexity constraints. A genaralized software simulator of the onboard scheduling and switching operations was implemented. For this effort, we derive blocking probability formulae for an M/M/S/S queueing system with framing. Over 100 large-scale simulations were made of a system with a 5 x 5 switch, 100 slots per frame, and two-way circuit capability. Each run simulated 61.1 hours of circuit traffic only, or 83.3 minutes of integrated traffic. Dissert. Abstr.

N85-23813*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARGE SPACE ANTENNA SYSTEMS TECHNOLOGY, 1984
William J. Boyer, comp. Apr. 1985 466 p refs Conf. held in Hampton, Va., 4-6 Dec. 1984 2 Vol.
(NASA-CP-2368-Pt-1; L-15950-Pt-1; NAS 1.55:2368-Pt-1) Avail: NTIS HC A20/MF A01 CSCL 22B

Papers are presented which provide a comprehensive review of space missions requiring large antenna systems and of the status of key technologies required to enable these missions. Topic areas include mission applications for large space antenna systems, large space antenna structural systems, materials and structures technology, structural dynamics and control technology, electromagnetics technology, large space antenna systems and the space station, and flight test and evaluation. For individual titles, see N85-23814 through N85-23839.

N85-23814*# National Aeronautics and Space Administration, Washington, D. C.
NASA MOBILE SATELLITE PROGRAM
George Knouse and William Weber (JPL, California Inst. of Tech., Pasadena) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 1-25 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

A three phase development program for ground and space segment technologies which will enhance and enable the second and third generation mobile satellite systems (MSS) is outlined. Phase 1, called the Mobile Satellite Experiment (MSAT-X), is directed toward the development of ground segment technology needed for future MSS generations. Technology validation and preoperational experiments with other government agencies will be carried out during the two year period following launch. The satellite channel capacity needed to carry out these experiments will be obtained from industry under a barter type agreement in exchange for NASA provided launch services. Phase 2 will develop and flight test the multibeam spacecraft antenna technology needed to obtain substantial frequency reuse for second generation commercial systems. Industry will provide the antenna, and NASA will fly it on the Shuttle and test it in orbit. Phase 3 is similar to Phase 2 but will develop an even larger multibeam antenna and test it on the space station. M.G.

N85-23815*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALTERNATIVES FOR SATELLITE SOUND BROADCAST SYSTEMS AT HF AND VHF c32
Bruce E. LeRoy *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 27-37 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

The National Aeronautics and Space Administration and the United States Information Agency (USIA) are currently engaged in a joint program to assess the technical and economic feasibility of direct sound broadcast satellite systems to meet USIA mission

needs. The cooperative effort calls for a series of interrelated studies to provide the respective Agency managements with information on the potential role of direct broadcast satellites. Initial studies focused on HF propagation phenomena and broadcast coverage requirements. These studies served as the basis for parallel systems studies currently in progress. The systems studies are to provide a data base on various satellite configurations and systems concepts capable of supporting potential broadcast requirements ranging from a small fraction to a substantial addition to USIA requirements. Antenna concepts for LEO and GEO orbits are briefly described. M.G.

N85-23816*# Federal Aviation Administration, Washington, D.C.
DEVELOPMENT CONCERNS FOR SATELLITE-BASED AIR TRAFFIC CONTROL SURVEILLANCE SYSTEMS **c04**
Keith D. McDonald *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 39-62 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 17G

Preliminary results of an investigation directed toward the configuration of a practical system design which can form the baseline for assessing the applications and value of a satellite based air traffic surveillance system for future use in the National Airspace System (NAS) are described. This work initially studied the characteristics and capabilities of a satellite configuration which would operate compatibly with the signal structure and avionics of the next generation air traffic control secondary surveillance radar system, the Mode S system. A compatible satellite surveillance system concept is described and an analysis is presented of the link budgets for the various transmission paths. From this, the satellite characteristics are established involving a large multiple feed L band antenna of approximately 50 meter aperture dimension. Trade offs involved in several of the alternative large aperture antennas considered are presented as well as the influence of various antenna configurations on the performance capabilities of the surveillance system. The features and limitations of the use of large aperture antenna systems for air traffic surveillance are discussed. Tentative results of this continuing effort are summarized with a brief description of follow on investigations involving other space based antenna systems concepts. M.G.

N85-23817*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF PUSHBROOM ALTIMETRY FROM SPACE USING LARGE SPACE ANTENNAS
C. L. Parsons (NASA. Goddard Space Flight Center), J. T. McGoogan (NASA. Goddard Space Flight Center), and F. B. Beck *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 63-71 Prepared in cooperation with NASA. Wallops Flight Center) (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The capabilities of multibeam altimetry are discussed and an interferometric multibeam technique for doing precision altimetry is described. The antenna feed horn arrangement and the resulting footprint lube pattern are illustrated. Plans for a shuttle multibeam altimetry mission are also discussed. M.G.

N85-23818*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ORBITING MULTI-BEAM MICROWAVE RADIOMETER FOR SOIL MOISTURE REMOTE SENSING **c43**
J. C. Shiue (NASA. Goddard Space Flight Center) and R. W. Lawrence *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 73-85 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 08H

The effects of soil moisture and other factors on soil surface emissivity are reviewed and design concepts for a multibeam microwave radiometer with a 15 m antenna are described. Characteristic antenna gain and radiation patterns are shown and losses due to reflector roughness are estimated. M.G.

N85-23819*# Naval Research Lab., Washington, D. C. Space Sensing Applications Branch.
LOW-FREQUENCY MICROWAVE RADIOMETER FOR N-ROSS **c32**
J. P. Hollinger and R. C. Lo *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 87-95 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

The all weather, global determination of sea surface temperature (SST) has been identified as a requirement needed to support naval operations. The target SST accuracy is + or - 1.0 K with a surface resolution of 10 km. Investigations of the phenomenology and technology of remote passive microwave sensing of the ocean environment over the past decade have demonstrated that this objective is presently attainable. Preliminary specification and trade off studies were conducted to define the frequency, polarization, scan geometry, antenna size, and other esstential parameters of the low frequency microwave radiometer (LFMR). It will be a dual polarized, dual frequency system at 5.2 and 10.4 GHz using a 4.9 meter deployable mesh surface antenna. It is to be flown on the Navy-Remote Ocean Sensing System (N-ROSS) satellite scheduled to be launched in late 1988. M.G.

N85-23820*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
LARGE SPACE ANTENNA TECHNOLOGY APPLIED TO RADAR-IMAGING, RAIN-RATE MEASUREMENTS, AND OCEAN WIND SENSING **c43**
R. K. Moore and S. P. Gogineni *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 97-108 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

During the last decade, the utility of spaceborne microwave remote sensing systems for ocean windspeed measurement, ocean wave imaging and sea ice studies was demonstrated. Development of large space antennas offers some interesting possibilities for rain rate measurements, ocean and ice studies, and radar imaging. The joint use of active and passive sensors using the 15 m antenna for ocean, ice, and soil moisture studies; rain rate measurements; and radar imaging is considered. Verification of the frequency agile rain radar concept with Shuttle offers the possibility of much needed rain rate statistics over the ocean. Author

N85-23821*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADVANCED 2-FREQUENCY OCEAN SENSING RADAR USING HIGH RESOLUTION ANTENNA BEAMS **c32**
D. E. Weissman (Hofstra Univ., Hempstead, N.Y.) and J. W. Johnson *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 109-115 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

The opportunity to use a large space antenna system for remote sensing applications permits the creation of an advanced ocean sensing radar that combines the abilities of previously developed techniques. The 15 meter antenna will permit much higher angular and spatial resolution at the surface that will lead to techniques of observing ocean wave heights and the directional spectrum that had not previously been feasible from space. At the same time, sensors to measure ocean surface winds can be in operation and the data from both can be combined to increase the accuracy of each individual sensor. The existing capabilities and sensor techniques with typical data characteristics for the individual measurement of sea surface quantities are outlined. Author

N85-23822*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
QUASAT: AN ORBITING VERY LONG BASELINE INTERFEROMETER PROGRAM USING LARGE SPACE ANTENNA SYSTEMS **c32**
J. F. Jordan, R. E. Freeland, G. S. Levy, and D. L. Potts *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 117-125 (For primary document see

N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

QUASAT, which stands for QUASAR SATELLITE, is the name given to a new mission being studied by NASA. The QUASAT mission concept involves a free flying Earth orbiting large radio telescope, which will observe astronomical radio sources simultaneously with ground radio telescopes. The primary goal of QUASAT is to provide a system capable of collecting radio frequency data which will lead to a better understanding of extremely high energy events taking place in a variety of celestial objects including quasars, galactic nuclei, interstellar masers, radio stars and pulsars. QUASAT's unique scientific contribution will be the increased resolution in the emission brightness profile maps of the celestial objects. Author

N85-23823*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LDR SYSTEM CONCEPTS AND TECHNOLOGY c89
Bruce Pittman *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 127-138 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 03A

The Large Deployable Reflector is a 20 meter diameter infrared/submillimeter telescope planned for the late 1990's. The Astronomy Survey Committee of the National Academy of Sciences (Field Committee) recommended LDR as one of the two space based observatories that should start development in the 80's. LDR's large aperture will give it unequaled resolution in the wavelength range from 30 to 1000 microns. To meet LDR performance goals will call for advances in several technology disciplines including: optics, controls, thermal control, detectors, cryogenic cooling, and large space structures. B.G.

N85-23824*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
WRAP-RIB ANTENNA TECHNOLOGY DEVELOPMENT
R. E. Freeland, N. F. Garcia (Lockheed Missiles and Space Co., Sunnyvale, Calif.), and H. Iwamoto (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 139-166 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The wrap-rib deployable antenna concept development is based on a combination of hardware development and testing along with extensive supporting analysis. The proof-of-concept hardware models are large in size so they will address the same basic problems associated with the design fabrication, assembly and test as the full-scale systems which were selected to be 100 meters at the beginning of the program. The hardware evaluation program consists of functional performance tests, design verification tests and analytical model verification tests. Functional testing consists of kinematic deployment, mesh management and verification of mechanical packaging efficiencies. Design verification consists of rib contour precision measurement, rib cross-section variation evaluation, rib materials characterizations and manufacturing imperfections assessment. Analytical model verification and refinement include mesh stiffness measurement, rib static and dynamic testing, mass measurement, and rib cross-section characterization. This concept was considered for a number of potential applications that include mobile communications, VLBI, and aircraft surveillance. In fact, baseline system configurations were developed by JPL, using the appropriate wrap-rib antenna, for all three classes of applications. Author

N85-23825*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEVELOPMENT OF THE 15-METER HOOP-COLUMN ANTENNA SYSTEM
T. G. Campbell, D. H. Butler, K. Belvin, and B. B. Allen (Harris Corp., Melbourne, Fla.) *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 167-212 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The development of the 15-meter hoop/column antenna system is presented. The 15-meter deployable structure is discussed along with the mulitple-beam feed system development and the structures and RF testing planned in 1985. The topics presented are: overview of antenna development activities; development of 15-meter reflector and kinematic deployment tests; preliminary modal survey test results and future structural dynamics tests; and radio frequency subsystems and near field testing. B.G.

N85-23826*# Martin Marietta Aerospace, Denver, Colo.
BOX TRUSS DEVELOPMENT AND ITS APPLICATION
J. V. Coyner *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 213-236 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

Since 1977, Martin Marietta Denver Aerospace has aggressively pursued development of deployable structural systems applicable to a wide variety of Shuttle-transportable large space system requirements. This effort has focused on the deployable box truss, mechanisms and materials development, mesh reflector design and fabrication, gate frame truss design and fabrication, and offset-fed antenna design and analysis. The activities discussed are: box truss design; metal matrix composites; precision joints; enhanced passive damping design; mesh reflector development; gate frame truss for solar arrays; 15-meter spinning radio meter; and 60 x 120 meter push broom antenna. B.G.

N85-23827*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SYNCHRONOUSLY DEPLOYABLE TETRAHEDRAL TRUSS REFLECTOR
H. G. Bush, C. L. Herstrom, P. A. Stein, and R. R. Johnson (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 237-250 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

For apertures above 50 meters, the high structural stiffness and compact packaging of tetrahedral truss make this concept an attractive candidate for the reflector support structure. Various features of a deployable, foldable, doubly curved tetrahedral truss structure are presented as well as methods used to design the truss geometry and to synchronize deployment of the folding elements. An arc division method for distributing truss nodal locations over a doubly curved reflector surface is shown to decrease differences in surface strut lengths and to increase the geometric similarity of all node condigurations in each strut surface. These features enhance the design of a single node and strut synchronizer mechanism for each surface examined. The folding error resulting from using this approach is minimal. A.R.H.

N85-23828*# TRW Electronics and Defense Sector, Redondo Beach, Calif.
ANTENNA TECHNOLOGY FOR QUASAT APPLICATION c32
John S. Archer and William B. Palmer *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 251-270 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

A hybrid growth version of the advanced Sunflower, or precision deployable, antenna was adopted as the configuration proposed for the QUASAT very long baseline interferometry mission. The antenna consists of rigid panels of graphite-epoxy facesheets covering aluminum honeycomb sandwich. The six main folding panels are hinged to a cantilevered support ring attached to the periphery of the center section. Six pairs of intermediate panels are located between these panels and are hinged to each other and to the main panels. The flight configuration, antenna weight, a mass properties, frequency, and contour tolerance are discussed. The advantages of the solid antenna surface cover an all-mesh contour are examined. A.R.H.

N85-23829*# TRW Space Technology Labs., Redondo Beach, Calif.
CABLE-CATENARY LARGE ANTENNA CONCEPT

W. Akle *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 271-278 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

Deployable to very large diameters (over 1000 ft), while still remaining compatible with a complete satellite system launch by STS, the cable-catenary antenna comprises: 8 radial deployable boom masts; a deployable hub and feed support center mast; balanced front and back, radial and circumferential catenary cabling for highly accurate (mm) surface control; no interfering cabling in the antenna field; and an RF reflecting mesh supported on the front catenaries. Illustrations show the antenna-satellite system deployed and stowed configurations; the antenna deployment sequence; the design analysis logic; the sizing analysis output, and typical parametric design data. A.R.H.

N85-23830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTREME PRECISION ANTENNA REFLECTOR STUDY RESULTS c45
G. R. Sharp, L. D. Gilger (Harris Corp., Melbourne, Fla.), and K. E. Ard (Harris Corp., Melbourne, Fla.) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 279-300 ref (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

Thermal and mechanical distortion degrade the RF performance of antennas. The complexity of future communications antennas requires accurate, dimensionally stable antenna reflectors and structures built from materials other than those currently used. The advantages and disadvantages of using carbon fibers in an epoxy matrix are reviewed as well as current reflector fabrications technology and adjustment. The manufacturing sequence and coefficient of thermal expansion of carbon fiber/borosilicate glass composites is described. The construction of a parabolic reflector from this material and the assembling of both reflector and antenna are described. A 3M-aperture-diameter carbon/glass reflector that can be used as a subassembly for large reflectors is depicted. The deployment sequence for a 10.5M-aperture-diameter antenna, final reflector adjustment, and the deployment sequence for large reflectors are also illustrated. A.R.H.

N85-23831*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA SPACE MATERIALS RESEARCH c27
Darrel R. Tenney, Stephen S. Tompkins, and George F. Sykes *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 301-329 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 11G

The effect of the space environment on: (1) thermal control coatings and thin polymer films; (2) radiation stability of 250 F and 350 F cured graphite/epoxy composites; and (3) the thermal mechanical stability of graphite/epoxy, graphite/glass composites are considered. Degradation in mechanical properties due to combined radiation and thermal cycling is highlighted. Damage mechanisms are presented and chemistry modifications to improve stability are suggested. The dimensional instabilities in graphite/epoxy composites associated with microcracking during thermal cycling is examined as well as the thermal strain hysteresis found in metal-matrix composites. A.R.H.

N85-23832*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEW CONCEPTS IN DEPLOYABLE BEAM STRUCTURES
Marvin D. Rhodes *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 331-348 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The design of deployable structures involves a complicated tradeoff of packaging efficiency, the overall mechanism associated with deploying and latching beam joints, and the requirements and complexity of the beam deployer/repacker. Three longeron deployable beams, controllable geometry beams, and hybrid deployable/erectable beam concepts are evaluated. Author

N85-23833*# Cambridge Research Associates, Mass.
PRECISION SPACE STRUCTURES
Keto Soosaar *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 349-359 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

NASA large space structures efforts to date aimed towards large, flexible antenna-like structures (30-100M) with relatively long wavelengths (1-30cm) and moderate disturbances leading to some structure-control interaction. Potential missions in the OPTICS regime require small reflectors/mirrors, short wavelengths (visible to 100 microns), very tight tolerances in surface, alignment, pointing stability, as well as the potential of considerable on-board disturbances. For optics systems: figure/surface control can be quasi-static, active/passive isolation schemes are possible, vibration control is necessary, and the attitude control system can be low BW - Ground testing of reflectors and mirrors is more feasible than with antennas. Author

N85-23834*# Astro Research Corp., Carpinteria, Calif.
PRECISION ANTENNA REFLECTOR STRUCTURES
John M. Hedgepeth *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 361-373 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The assembly of the Large Precise Reflector Infrared Telescope is detailed. Also given are the specifications for the Aft Cargo Carrier and the Large Precision Reflector structure. Packaging concepts and options, stowage depth and support truss geometry are also considered. An example of a construction scenario is given. E.R.

N85-23835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE STATION STRUCTURES
W. Schneider *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 375-392 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

A brief overview of some structural results that came from space station skunk works is presented. Detailed drawings of the pressurized modules, and primary truss structures such as deployable single fold beams, erectable beams and deployable double folds are given. Typical truss attachment devices and deployable backup procedures are also given. E.R.

N85-23836*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VERIFICATION FOR LARGE SPACE STRUCTURES
J. Chen and J. Garba *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 393-406 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

The primary concern for verification is the dynamic characteristics of the space structure related to the control and sensor/actuator location. Properties such as modal density, range of natural frequencies, and modal displacements at the sensor/actuator location are considered and are simulated for the verification of the structure/control closed loop system. A space beam is studied in zero gravity environment and in a 1 G gravity environment, along with their governing equations. E.R.

N85-23837*# Kentron International, Inc., Hampton, Va.
AN OPTIMIZATION STUDY TO MINIMIZE SURFACE DISTORTIONS OF A HOOP-COLUMN ANTENNA
G. A. Wrenn *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 407-422 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

An automated procedure to lessen the tedium of manual approach currently used to minimize surface distortions in a hoop/column antenna is studied. Three fundamental elements are used for the study: (1) The finite element analysis program is

used to calculate the antenna surface distortions due to externally applied loads; (2) a general purpose optimization program is used to determine the set of control cable tensions which minimize the antenna surface distortions; and (3) another program is used to calculate the best fit parabola passing through a distorted antenna shape and to calculate the RMS distortion error. The interim results of this feasibility study are given. E.R.

N85-23838*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL DYNAMICS ANALYSIS
J. Housner, M. Anderson, W. Belvin, and G. Horner *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 423-445 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

Dynamic analysis of large space antenna systems must treat the deployment as well as vibration and control of the deployed antenna. Candidate computer programs for deployment dynamics, and issues and needs for future program developments are reviewed. Some results for mast and hoop deployment are also presented. Modeling of complex antenna geometry with conventional finite element methods and with repetitive exact elements is considered. Analytical comparisons with experimental results for a 15 meter hoop/column antenna revealed the importance of accurate structural properties including nonlinear joints. Slackening of cables in this antenna is also a consideration. The technology of designing actively damped structures through analytical optimization is discussed and results are presented. Author

N85-23839*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
AFWAL SPACE CONTROL TECHNOLOGY PROGRAM
V. O. Hoehne *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 447-463 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

An overview of space oriented control technology programs which are applicable to flexible large space structures is presented. The spacecraft control activity is interdisciplinary with activities in structures, structural dynamics and control brought together. The large flexible structures to be controlled have many physical factors that influence the final controllability of the vehicle. Factors are studied such as rigidity of both structural elements and joints, damping inherent in both material as well as discrete dampers located throughout the structure, and the bandwidth of both sensors and actuators used to sense motion and control it. Descriptions of programs both in-house and contracted are given. E.R.

N85-23840*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARGE SPACE ANTENNA SYSTEMS TECHNOLOGY, 1984
William J. Boyer, comp. Apr. 1985 484 p refs Conf. held in Hampton, Va., 4-6 Dec. 1984 2 Vol.
(NASA-CP-2368-Pt-2; L-15950-Pt-2; NAS 1.55:2368-Pt-2) Avail: NTIS HC A21/MF A01 CSCL 22B

Mission applications for large space antenna systems; large space antenna structural systems; materials and structures technology; structural dynamics and control technology, electromagnetics technology, large space antenna systems and the Space Station; and flight test and evaluation were examined. For individual titles, see N85-23841 through N85-23866.

N85-23841*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON-ORBIT SYSTEMS IDENTIFICATION OF FLEXIBLE SPACECRAFT TECHNOL., 1984, PT. 2 Apr. 1985 P 465-481
Larry Taylor and Larry D. Pinson *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 ?ILLEGAL DATE? p 465-481 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Future spacecraft include configurations which are too flexible to be adequately tested prior to flight and which will require on-orbit systems identification to ensure safe operation of the flight control system. The structural dynamics model will evolve and its accuracy will improve in stages as ground tests of full-scale components and replica-scale models are performed. State Space Modeling and Conditional Maximum Likelihood Parameter Estimation methodology can provide the formal probability-based framework for the process of upgrading a model as additional test results are obtained. Although the number of unknown parameters can be reduced by the use of canonical forms for the stability matrix, the number of unknown model parameters quickly becomes unmanageable unless advantage is taken of the relationship of a much fewer number of global model parameters. Distributed parameter systems or partial differential equation models are one way to take advantage of such global parameters to reduce the number of unknown model parameters. B.G.

N85-23842*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EIGENSYSTEM REALIZATION ALGORITHM FOR APPLICATION TO MODAL TESTING c61
Jer-Nan Juang *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 483-502 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 09B

Important features of the Eigensystem Realization Algorithm (ERA) are summarized as follows: (1) from the computational standpoint, the algorithm is attractive, since only simple numerical operations are needed; (2) the computational procedure is numerically stable; (3) the structural dynamics requirements for modal parameter identification and the control design requirements for a reduced-state space model are satisfied; (4) data from more than one test can be used simultaneously to efficiently identify the closely spaced eigenvalues; and (5) no restrictions on number of measurements are imposed. Author

N85-23843*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC DATA ANALYSIS OF THE SAFE/DAE EXPERIMENT
R. W. Schock, T. E. Nesman, and D. K. Reed *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 505-516 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The Solar Array Flight Experiment (SAFE) on-orbit experiment for measurement of large structures dynamics consists of a dynamic sensing system designed to record and analyze the dynamic characteristics of the SAFE. The early availability of the SAFE and its basic large space structure characteristics made it a logical candidate for verification of the sensing system and evaluation technique. The characteristics of the solar array which place it well within the generic class of large space structures are: (1) Large size; (2) Low natural frequencies; (3) Mechanical complexity of its extendable/retractable mast; and (4) The inability to dynamic test in Earth atmosphere and one g. G.L.C.

N85-23844*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY RESEARCH CENTER PHOTOGRAMMETRIC MEASUREMENTS OF SOLAR ARRAY DYNAMICS: PRELIMINARY RESULTS c44
M. Larry Brumfield, Richard S. Pappa, James B. Miller, and Richard R. Adams *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 577-545 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 10A

The NASA Langley Research Center participated in the Solar Array Experiment with two primary objectives: (1) to study the structural and control dynamics of a new class of large, lightweight, low-frequency space structures, and (2) to develop technology for remote video measurement of structural motions. The shuttle orbiter's closed circuit television (CCTV) system was used to provide recorded video images of the solar array from four locations in the payload bay, two on the forward bulkhead and two on the aft bulkhead. White reflective targets were placed on the array to

provide discrete points at which to track array motion. A dynamic test consisted of a quiescent period in which orbiter operations were inhibited and crew motion restricted, an excitation period, and a free decay period. The orbiter was placed in free drift while in a gravity gradient orientation and dynamics tests were timed to occur at orbital noon so that the Sun would illuminate one side of the array and Earth albedo the other. The CCTV system was turned on during the quiescent period, approximately 3 minutes prior to excitation. Video from all four CCTV cameras was recorded continuously through the excitation and free-decay periods for a total test record of 8 to 10 minutes. G.L.C.

N85-23845*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LARGE ANTENNA CONTROL METHODS: CURRENT STATUS AND FUTURE TRENDS
G. Rodriguez, Y. H. Lin, and M. H. Milman *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 547-568 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Current methods for control of large antennas, as well as future trends required for improved performance are addressed. Some of the target missions in which these methods would be used are: the Land Mobile Satellite System (LMSS) for communications; the Satellite Surveillance (SSS) for aircraft traffic control; the orbiting Very Long Baseline Interferometer (VLBI), or QUASAT, for radio astronomy; and the Large Deployable Reflector (LDR) for IR and submillimeter astronomy. G.L.C.

N85-23846*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL DEVELOPMENT OF A FAILURE DETECTION SCHEME FOR LARGE SPACE STRUCTURES
Raymond C. Montgomery and Jeffrey P. Williams *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 569-589 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Large flexible spacecraft may require control systems consisting of large numbers of sensors and actuators. To assure a viable mission, the control system should tolerate failures of some of the control components. Hence, it is desirable to automate the process of failure detection, identification, and control system reconfiguration (FDI&R). Some of the opportunities to accommodate failure in the spacecraft design are reviewed. Some methods for FDI&R are presented in overview, and the method chosen for experimental testing is described. Finally, the experimental activities leading to the validation of the technique are presented. G.L.C.

N85-23847*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DYNAMIC VERIFICATION OF LARGE SPACE STRUCTURES
D. K. Tollison (Control Dynamics Co., Huntsville, Ala.) and H. B. Waites *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 591-601 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The Marshall Space Flight Center developed a facility in which closed-loop control of large space structures (LSS) can be demonstrated and verified. The main objective of the facility is to verify LSS control system techniques so that on-orbit performance can be ensured. The facility consists of an LSS test article which is connected to a payload mounting system that provides control torque commands. It is attached to a base excitation system which simulates disturbances most likely to occur for orbiter and DOD payloads. A control computer contains the calibration software, the reference system, the alignment procedures, the telemetry software, and the control algorithms. The total system will be suspended in such a fashion that the LSS test article has the characteristics common to all LSS. M.G.

N85-23848*# Martin Marietta Corp., Denver, Colo.
PASSIVE AND ACTIVE CONTROL OF SPACE STRUCTURES (PACOSS)
G. Morosow, H. Harcrow, and L. Rogers (Air Force Wright Aeronautical Labs., Dayton, Ohio) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 603-615 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Passive and Active Control of Space Structures (PACOSS) is a five-year program designed to investigate highly damped structures in conjunction with active control systems, and in particular to develop technology that integrates passive damping and active control to achieve precise pointing control. Major areas of research include metal matrix composites; viscoelastic materials; damping devices; dynamic test article design, fabrication and testing; and active damping. M.G.

N85-23849*# Harris Corp., Melbourne, Fla.
APPLICATION OF THE MAXIMUM ENTROPY/OPTIMAL PROJECTION CONTROL DESIGN APPROACH FOR LARGE SPACE STRUCTURES
D. C. Hyland *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 617-654 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The underlying philosophy and motivation of the optimal projection/maximum entropy (OP/ME) stochastic modelling and reduced order control design method for high order systems with parameter uncertainties are discussed. The OP/ME design equations for reduced-order dynamic compensation including the effect of parameter uncertainties are reviewed and the application of the methodology to several large space structure (LSS) problems of representative complexity is illustrated. M.G.

N85-23850*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELECTROMAGNETIC ANALYSIS FOR SURFACE TOLERANCE EFFECTS ON LARGE SPACE ANTENNAS
C. R. Cockrell and R. C. Rudduck (Ohio State Univ., Columbus) *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 655-673 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Antenna tolerance theory for periodic-deterministic type surface distortions is discussed. The phase perturbation distribution for a 15 meter quad aperture antenna is determined. The E-plane and H-plane patterns for smooth and periodically distorted reflector surfaces are given. M.G.

N85-23851*# Ohio State Univ., Columbus.
APPLICATION OF MODERN APERTURE INTEGRATION (AI) AND GEOMETRICAL THEORY OF DIFFRACTION (GTD) TECHNIQUES FOR ANALYSIS OF LARGE REFLECTOR ANTENNAS c32
Roger C. Rudduck *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 675-691 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

The application of aperture integration (AI) and geometrical theory of diffraction (GTO) techniques to analyze large reflector antennas is outlined. The following techniques were used: computer modeling, validation of analysis and computer codes, computer aided design modifications, limitation on the conventional aperture integration (AIC) method, extended aperture integration (AIE) method, the AIE method for feed scattering calculations, near field probing predictions for 15 meter model, limitation on AIC for surface tolerance effects, aperture integration on the surface (AIS) method, and AIC and GTD calculations for compact range reflector. E.A.K.

N85-23852*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FEED SYSTEM DESIGN CONSIDERATIONS FOR LARGE SPACE ANTENNA SYSTEMS. PART 1: MULTIPLE APERTURES WITH

NON-OVERLAPPING FEEDS c32

M. C. Bailey *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 693-702 (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 20N

A feed system design for large space antenna systems was considered. A multiple aperture system with nonoverlapping feeds is examined. Circular and quadrant aperture reflector radiation patterns are compared and the effect of adjacent aperture on radiation patterns of multiple aperture reflector antennas is illustrated. The following systems are examined: (1) feed design optimization for a multiple aperture reflector antenna; (2) radiation pattern for two quadrant reflector with optimized feed design; (3) multiple beam concept utliizing apertures and nonoverlapping feeds; (4) beam contours for two quadrant of multiple beam multiple aperture concept; (5) superposition of beams from two quadrants of multiple beam multiple aperture concent; (6)compensation for mislalignment of interleaved beams from two quadrants; and (7) beam quality improvement due to reorienting feed for offset reflector. E.A.K.

N85-23853*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FEED SYSTEM DESIGN CONSIDERATIONS FOR LARGE SPACE ANTENNA SYSTEMS. PART 2: SINGLE APERTURE WITH OVERLAPPING FEEDS c32

V. Jamnejad *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 703-713 refs (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 20N

Contiguous multiple beams are used to make use of the set of frequency bands at different beams at different geographical locations and achieve the most efficient use of precious frequency allocation. This is feasible only if the interference among cochannel beams is below some acceptable level, by carrier/interference (C/I) ratio. Individual beam patterns of very low sidelobes, which in turn necessitates narrow feed are required. A physically realizable solution to this problem entails either more than one reflector, more complicated optics, or breaking of each feed into a cluster of smaller elements, some of which would then be shared by adjacent beams. The latter, however, requires a complicated beamforming network (BFN) for the proper feeding of the elements. The feedpacking problem is not unique to reflector antennas and exists in lens type antennas as well. The BFN and associated problems are present in the phased array antennas and on a much larger scale. Poor scan capabilities are associated with reflector systems. The scan properties of offset fed reflector systems can be improved by choosing a very large focal length to parent reflector diameter ((F/Dp) ratio, which requires a longer boom to support the feed. In the case of reflectors with cluster feed arrangements, the scan capability for smaller F/Dp ratios is improved by proper adjustment of cluster element excitations. Such a system seems to be appropriate for up to 10 beamwidths scan. For a larger number of beams, systems with wider scan capabilities, such as phased arrays or phased array/reflector combinations, become more appealing. E.A.K.

N85-23854*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DIFFRACTION ANALYSIS OF MESH DEPLOYABLE REFLECTOR ANTENNAS c32

Y. Rahmat-Samii *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 715-736 (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 20N

A formulation and many representative numerical results for mesh reflector antennas are presented. The reflection coefficient matrix for the prescribed mesh configuration was determined and the local coordinate system of the mesh cells at each point on the curved reflector surface was accentuated. A novel strip aperture model was used to formulate the transmission coefficient matrix for a variety of mesh cell configurations. Numerical data are tailored to the dimensions of a conceptually designed land mobile satellite system (LMSS) which employs a large mesh deployable offset parabolic antenna. Results are shown for an offset parabolic reflector with mesh surfaces similar to the mesh surface of tracking and data relay satellite system (TDRSS). E.A.K.

N85-23855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DETERMINATION OF ELECTROMAGNETIC PROPERTIES OF MESH MATERIAL USING ADVANCED RADIOMETER TECHNIQUES c32

R. F. Arrington and H. J. C. Blume *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 737-756 refs (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 20N

The need for a large diameter deployable antenna to map soil moisture with a 10 kilometer or better resolution using a microwave radiometer is discussed. A 6 meter deployable antenna is also needed to map sea surface temperature on the Navy Remote Ocean Sensor System (NROSS). Both of these deployable antennas require a mesh membrane material as the reflecting surface. The determination of the electromagnetic properties of mesh materials is a difficult problem. The Antenna and Microwave Research Branch (AMRB) of Langley Research Center was asked to measure the material to be used on MROSS by NRL. A cooperative program was initiated to measure this mesh material using two advanced radiometer techniques. B.W.

N85-23856*# Boeing Aerospace Co., Seattle, Wash.

THE SPACE STATION AS A CONSTRUCTION BASE FOR LARGE SPACE STRUCTURES

R. M. Gates *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 757-769 (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 22B

The feasibility of using the Space Station as a construction site for large space structures is examined. An overview is presented of the results of a program entitled Definition of Technology Development Missions (TDM's) for Early Space Stations - Large Space Structures. The definition of LSS technology development missions must be responsive to the needs of future space missions which require large space structures. Long range plans for space were assembled by reviewing Space System Technology Models (SSTM) and other published sources. Those missions which will use large space structures were reviewed to determine the objectives which must be demonstrated by technology development missions. The three TDM's defined during this study are: (1) a construction storage/hangar facility; (2) a passive microwave radiometer; and (3) a precision optical system. B.W.

N85-23857*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research and Development Div.

UTILIZATION OF SPACE STATION BY THE LARGE DEPLOYMENT REFLECTOR

L. W. Bandermann and W. H. Aiff *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 771-774 refs (For primary document see N85-23840 14-15)

Avail: NTIS HC A21/MF A01 CSCL 22B

The Large Deployable Reflector (LDR), a NASA concept of a very large, orbiting, far infrared submillimeter telescope is described. To be launched in the 1990s, LDR has a projected life of 10 years and is to be serviced every 2 to 3 years. A System Concept and Technology Definition Study of LDR for NASA Ames is currently being conducted. Study results indicate that launch of a 20 m LDR, operating in a 700 to 800 km orbit, requires two shuttle loads. The components of LDR are assembled in a lower parking orbit, and the system is checked out and then transferred to the operational orbit. Furthermore, for servicing, LDR may have to be retrieved to the same lower orbit (and later returned to operational altitude) by an orbit transfer vehicle. These requirements bring up the question of a suitable assembly, checkout, and servicing platform. The deployment process is time consuming and may

require special equipment not necessarily available from the orbiter itself. The SS is an attractive choice for that platform. B.W.

N85-23858*# Eastman Kodak Co., Rochester, N. Y.
LARGE DEPLOYABLE REFLECTOR (LDR) REQUIREMENTS FOR SPACE STATION ACCOMMODATIONS
David A. Crowe, Michael J. Clayton, and Fritz C. Runge (McDonnell, Douglas Astronautics Co., Huntington Beach, Calif.) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 775-791 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Top level requirements for assembly and integration of the Large Deployable Reflector (LDR) Observatory at the Space Station are examined. Concepts are currently under study for LDR which will provide a sequel to the Infrared Astronomy Satellite and the Space Infrared Telescope Facility. LDR will provide a spectacular capability over a very broad spectral range. The Space Station will provide an essential facility for the initial assembly and check out of LDR, as well as a necessary base for refurbishment, repair and modification. By providing a manned platform, the Space Station will remove the time constraint on assembly associated with use of the Shuttle alone. Personnel safety during necessary EVA is enhanced by the presence of the manned facility. B.W.

N85-23859*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A CONCEPT FOR A MOBILE REMOTE MANIPULATOR SYSTEM
Martin M. Mikulus, Jr., Harold G. Bush, Richard E. Wallsom, and J. Kermit Jensen *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 793-808 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

A conceptual design for a Mobile Remote Manipulator System (MRMS) is presented. This concept does not require continuous rails for mobility (only guide pins at truss hardpoints) and is very compact, being only one bay square. The MRMS proposed is highly maneuverable and is able to move in any direction along the orthogonal guide pin array under complete control at all times. The proposed concept would greatly enhance the safety and operational capabilities of astronauts performing EVA functions such as structural assembly, payload transport and attachment, space station maintenance, repair or modification, and future spacecraft construction or servicing. The MRMS drive system conceptual design presented is a reasonably simple mechanical device which can be designed to exhibit high reliability. Developmentally, all components of the proposed MRMS either exist or are considered to be completely state of the art designs requiring minimal development, features which should enhance reliability and minimize costs. Author

N85-23860*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE-BASED ANTENNA MEASUREMENT SYSTEM CONCEPTS FOR SPACE STATION OPERATION
C. Louis Cuccia, Thomas G. Campbell, W. L. Pritchard (Satellite Systems Engineering, Inc., Bethesda, Md.), and Jud Lyon (Howland Co., Inc., Atlanta, Ga.) *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 809-843 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The capability to make functional checks of communications satellites in low Earth orbit before boost to geosynchronous orbit as well as other near term radio frequency applications is discussed. On orbit measurement capability for the multitude of antennas and microwave systems for future space station operations is also discussed. Examples of radio frequency systems requirements for on orbit measurement capability are presented. E.R.

N85-23861*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR ARRAY EXPERIMENT (SAE) FLIGHT EXPERIENCE
c44
Henry C. Hill, Leighton E. Young, and Gary F. Turner (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In* NASA. Langley Research Center Large Space Antenna systems Technol., 1984, Pt. 2 Apr. 1985 p 845-854 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 10A

The space flight testing of a large, flat, flexible panel solar array is examined. The experiment objectives are: to demonstrate the functional operational of the wind deployment and packaging system; Electrical performance; Thermal performance; and dynamic performance. A complete description of the experiment and the flight results are given. E.R.

N85-23862*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ASSEMBLY CONCEPT FOR CONSTRUCTION OF ERECTIBLE SPACE STRUCTURE (ACCESS) NEUTRAL BUOYANCY TESTING RESULTS
Walter L. Heard, Jr. *In its* Large Space Antenna systems Technol., 1984, Pt. 2 Apr. 1985 p 855-875 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

ACCESS, which is an acronym for Assembly Concept for Construction of Erectable Space Structure, is a planned Shuttle flight experiment to assess the potential of a manual on orbit construction concept and generate assembly data for correlation of ground test data. The individual parts (struts and nodal joints used to interconnect the struts) of the beam truss shown attached to the Shuttle in the figure are unpackaged and assembled by two astronauts working from fixed foot restraints (work stations). The planned flight experiment is described and results of the baseline neutral buoyancy simulation of the flight test are presented. Author

N85-23863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE TECHNOLOGY EXPERIMENTS PLATFORM (STEP) STATUS: AN IN-SPACE TEST FACILITY
Jack E. Harris *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 877-891 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

Designed for utilization of the space transportation system for technology experiments in space, the space technology experiment platform (STEP) is a shuttle-borne experiment support facility for use primarily for structures, structural dynamics, and control flexible structures technology flight experiments. The STEP concept is discussed as well as shows its relationship to broad NASA goals and objectives. The development chronology is presented and the current system capability in block diagram format is described. The STEP development schedule is included. E.R.

N85-23864*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTROL OF FLEXIBLE STRUCTURES (COFS) FLIGHT EXPERIMENT BACKGROUND AND DESCRIPTION
Brantley R. Hanks *In its* Large Space Antenna systems Technol., 1984, Pt. 2 Apr. 1985 p 893-908 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

A fundamental problem in designing and delivering large space structures to orbit is to provide sufficient structural stiffness and static configuration precision to meet performance requirements. These requirements are directly related to control requirements and the degree of control system sophistication available to supplement the as-built structure. Background and rationale are presented for a research study in structures, structural dynamics, and controls using a relatively large, flexible beam as a focus. This experiment would address fundamental problems applicable to large, flexible space structures in general and would involve a combination of ground tests, flight behavior prediction, and instrumented orbital tests. Intended to be multidisciplinary but basic

within each discipline, the experiment should provide improved understanding and confidence in making design trades between structural conservatism and control system sophistication for meeting static shape and dynamic response/stability requirements. Quantitative results should be obtained for use in improving the validity of ground tests for verifying flight performance analyses. A.R.H.

N85-23865*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SHUTTLE ATTACHED ANTENNA FLIGHT EXPERIMENT DEFINITION STUDY (FEDS)
G. J. Hannan *In* NASA. Langley Research Center Large Space Antenna systems Technol., 1984, Pt. 2 Apr. 1985 p 909-928 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The control algorithms, techniques, and hardware which would be required to support whether flight experiments of large space structures control are assessed for a 55-meter diameter wrap-rib reflector with a three degree-of-freedom gimbal. Strowman requirements were established for geometry, mass property, and elastic mode identification as well as for control and slewing. A five-body simulation of the Shuttle and test article was built with the ALLFLEX computer program. A maximum likelihood estimator, the flight experiment timeline, and the LSS control development test plan are discussed. A.R.H.

N85-23866*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELECTRO-SCIENCE REQUIREMENTS FOR SHUTTLE-ATTACHED ANTENNA FLIGHT EXPERIMENTS
William L. Grantham, Emedio M. Bracalente, and Lyle C. Schroeder *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 929-947 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 22B

The activities of an in-house electro-science task group organized to conduct studies of shuttle-attached flight experiments using the 15-meter hoop-column antennas as a research tool for developing both improved sensor technology and LSA technology are described. Some experiments could provide significant amounts of scientific data such as radio star mapping and definition of ocean current eddies over limited geographic regions. The experiments originate from the microwave remote sensing community and other areas which require the inherently higher resolution and boresite gain of large space antennas. Technology experiments are also being studied which would use the 15-meter antenna experiments as a stepping stone to 50 to 100 meter class reflector technology in the future. An antenna technology experiment using the 15-meter antenna in a shuttle-attached mission is discussed. Electromagnetic modeling is correct for each major subsystem and also to verify the interrelations of the subsystems. A.R.H.

N85-23867*# National Academy of Sciences - National Research Council, Washington, D. C.
ASSESSMENT OF CANDIDATE-EXPENDABLE LAUNCH VEHICLES FOR LARGE PAYLOADS Final Report
Sep. 1984 48 p refs
(Contract NASw-3511)
(NASA-CR-175540; NAS 1.26:175540; PB85-111912) Avail: NTIS HC A03/MF A01 CSCL 22D

In recent years the U.S. Air Force and NASA conducted design studies of 3 expendable launch vehicle configurations that could serve as a backup to the space shuttle--the Titan 34D7/Centaur, the Atlas II/Centaur, and the shuttle-derived SRB-X--as well as studies of advanced shuttle-derived launch vehicles with much larger payload capabilities than the shuttle. The 3 candidate complementary launch vehicles are judged to be roughly equivalent in cost, development time, reliability, and payload-to-orbit performance. Advanced shuttle-derived vehicles are considered viable candidates to meet future heavy lift launch requirements; however, they do not appear likely to result in significant reduction in cost-per-pound to orbit. GRA

N85-23868# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
DAMPING MODELS FOR FLEXIBLE COMMUNICATIONS SATELLITES BY SUBSTRUCTURAL DAMPING SYNTHESIS
P. C. Hughes Jan. 1985 62 p ref
(UTIAS-287; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

Most modern spacecraft are structurally flexible and, moreover, these spacecraft can naturally and profitably be analyzed as a collection of attached substructures (solar array panels, antennas, thermal radiators, etc.). Various models are combined for substructural energy dissipation so that an overall damping model for the spacecraft results. (Four such substructural damping models are discussed, two of which are shown to produce the same results.) Such a synthesis procedure proves valuable when substructural damping data is known, either from ground tests or detailed analysis. B.W.

N85-23869# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
DATA COLLECTION AND PLATFORM LOCATION BY SATELLITE: ARGOS USERS' CONFERENCE
1980 137 p refs Partly in ENGLISH and FRENCH Conf. held in Quebec, 1-2 Oct. 1980
Avail: NTIS HC A07/MF A01

Operational reliability of the ARGOS system; system performance, data distribution, and technical files; platform transmitter terminals; the PAPA meteorological buoy project; ARGOS operation in Arctic regions and ice environments; the BALSAMINE monsoon monitoring experiment; fishery data collection; and hydrological uses of ARGOS are discussed. For individual titles, see N85-23870 through N85-23882.

N85-23870# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM STATUS REPORT AFTER 2 YEARS OPERATION
Jean-Luc Bessis *In its* Data Collection and Platform Location by Satellite 1980 23 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

The ARGOS data collection and platform location contribution to the NOAA-TIROS program is reviewed. Of 100 platforms seen during each orbit, 60 are correctly located. Location error is < 100 m. Environmental data collection for atmospheric, oceanographic, and Earth sciences is increasing with each year of system operation. Apart from real time demands for meteorology, it is not possible to meet all user requirements by the sole implementation of direct readout stations. Author (ESA)

N85-23871# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
SYSTEM PERFORMANCE, DATA DISTRIBUTION AND TECHNICAL FILES
Alain Goasguen *In its* Data Collection and Platform Location by Satellite 1980 7 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

The performance and mode of operation of the ARGOS platform location function, means of resolving the ambiguity in the case of one-pass position calculations, and method for the calculation of platform position and speed using data acquired during two passes are discussed. Operational status of the data distribution system and means of access to experiment data are described. Practical aspects of the filling out ARGOS technical files once a program is admitted to the system are covered. Author (ESA)

N85-23872# Electronique Marcel Dassault, St. Cloud (France).
THE ARGOS PLATFORM TRANSMITTER TERMINALS (PTTS) c32
Michel Peberay *In* CNES Data Collection and Platform Location by Satellite 1980 8 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

Location and data collection platforms for use on ARGOS buoys, boats and balloons, and data collection only types for stations were developed. With the standard versions the sensor signals must be in serial binary form. However, an interface can be inserted between the sensors and electronics to meet specific requirements. The platforms operate at 406.1 MHz. Almost 500 platforms are in use. Author (ESA)

N85-23873# Compagnie pour l'Electronique, l'Informatique et les Systemes, Blagnac (France).

THE ARGOS VHF DIRECT READOUT MINI-STATION AND CML-80-MP DATA COLLECTION PLATFORM TRANSMITTER TERMINALS (PTTS) c32

Didier Bernadet *In* CNES Data Collection and Platform Location by Satellite 1980 6 p (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

The ARGOS VHF direct readout station structure, operation, performance, software options, cost/performance ratio, and maintenance are described. The CML-80-MP data collection platform design and environmental withstand capabilities are presented. Physical parameters that can be monitored by the platform are listed. Performance data concerning physical measurement and data transmission functions are given. The transmitter used with the platform is shown. Author (ESA)

N85-23874# Atmospheric Environment Service, Downsview (Ontario).

PROJECT PAPA: THE INTEGRATION OF DRIFTING BUOY DATA INTO AN OPERATIONAL METEOROLOGICAL SERVICE c48

Denis A. Bourque *In* CNES Data Collection and Platform Location by Satellite 1980 5 p ref (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

The Canadian Atmospheric Environment Service (AES) deployed expendable drifting meteorological buoys in the North-East Pacific Ocean. Because the data from the buoys are required in real-time a Local User Terminal (LUT) was developed to ingest, decode, identify, sort data, convert platform sensor data to engineering units, compute platform locations, encode the data into WMO DRIBU code messages and issue the messages on meteorological circuits, within an acceptable real-time frame. The success of the LUT revealed potential expansions of the Canadian observational system into other remote areas, and forced the AES to adopt a non-AES-user policy. Author (ESA)

N85-23875# Danish Meteorological Inst., Copenhagen.

APPLICATIONS OF ARGOS DATA COLLECTION SYSTEMS IN ARCTIC REGIONS c47

Flemming Jensen *In* CNES Data Collection and Platform Location by Satellite 1980 12 p (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

The Royal Danish Meteorological Institute agreed to maintain a minimum net of meteorological observations points in Greenland. This obligation is partly fulfilled by automatic observation stations. These stations are on remote locations and the most convenient method to communicate data is by METEOSAT and ARGOS data collecting systems. In the most northern part of Greenland geostationary satellites decline below the horizon and only ARGOS can be used. A ground station was established in Greenland to obtain real-time data from the ARGOS System. Problems related to operating ARGOS platforms in the Arctic are discussed. Author (ESA)

N85-23876# Ecole Polytechnique, Palaiseau (France). Lab. de Meteorologique Dynamique.

THE BALSAMINE EXPERIMENT c47

D. Cadet, H. Ovarlez, and G. Sommeria *In* CNES Data Collection and Platform Location by Satellite 1980 15 p refs Sponsored by CNES and Delegation Generale a la Recherche Scientifique et Technique (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

The BALSAMINE experiment studied the summer monsoonal flow within the boundary layer over the Indian Ocean. The experiment launched 88 superpressure constant-level balloons from 2 sites. The balloons, flying at 900 mb, were equipped with pressure and overpressure transducers, and temperature and humidity sensors. The corresponding parameters were measured every hour along the balloon trajectories. The localization and data collection were performed by the ARGOS system aboard the TIROS-N and NOAA-6 satellites. Trajectories obtained before and after the onset of the monsoon and examples of meteorological data transmitted by the balloons are presented. Author (ESA)

N85-23877# Tetra Tech, Inc., Pasadena, Calif.

MOUNTAIN BARRIER BAROCLINITY EFFECTS ON SURFACE WINDS ALONG THE ALASKAN ARCTIC COAST c47

Thomas L. Kozo *In* CNES Data Collection and Platform Location by Satellite 1980 11 p refs Sponsored by NOAA (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

Offshore pressure and position relaying buoys within the Arctic ice pack, using the ARGOS data collection system, were used to investigate mountain barrier baroclinity (MBB). Total atmospheric boundary layer turning with height was estimated by comparing computed three hourly geostrophic winds to simultaneous surface winds at Barter Island, Alaska. This total turning compared closely with wind velocity versus height data obtained through rawinsonde launches at Barter Island. Results indicate that the average turning of the wind from above the boundary layer to the surface is 140 deg during periods of MBB influence. The average difference between simultaneously measured surface winds at Barter Island and Pt. Barrow, Alaska (during MBB periods) is 140 deg, which cannot be explained by existing synoptic (large-scale) weather charts. The evidence explains wintertime abundance of west to southwest winds seen on monthly wind direction histograms from Barter Island (64 km north of the Brooks Range) while Pt. Barrow (300 km north of the Brooks Range) histograms for similar months show an east to northeast bias. Author (ESA)

N85-23878# Dome Petroleum Ltd., Calgary (Alberta).

DATA COLLECTION AND WINTER ICE DYNAMICS IN THE BEAUFORT SEA c48

R. D. Hoare, H. B. Mercer, and S. dePaoli *In* CNES Data Collection and Platform Location by Satellite 1980 15 p ref (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

Meteorological, oceanographic and ice motion data collection platforms were deployed on the ice in the Beaufort Sea during a program to develop a winter ice dynamics forecast model. Location and data were transmitted through the ARGOS link and were accessed daily by telex for quick-look purposes. Barometric pressure, internal temperature, and external air temperature were transmitted from all platforms while two platforms also transmitted ocean current (speed and direction) and magnetic bearing information. Data compression techniques and predeployment system check-out are described. Problems of deployment under early winter Arctic conditions, and data loss due to electronics failure and bear attack are discussed. Author (ESA)

N85-23879# National Research Inst. of Fisheries, Lisbon (Portugal).

AUTOMATIC BUOYS TO ASSIST THE TUNA FISHERY OFF THE AZORES c48

Gabriel Lobo Fialho and V. R. P. Barros *In* CNES Data Collection and Platform Location by Satellite 1980 11 p (For primary document see N85-23869 14-15)

Avail: NTIS HC A07/MF A01

The sea surface temperature in the Azores tuna fishery was measured by airborne precision radiation thermometers and by stations every 15 days. Calibration at sea of radiation thermometers in real time with data from buoys is described. Surface temperature and the temperature of mixed layers are compared. Mixed layer

depth and its stability in the Azores are discussed. Sea current speed and direction, and effects of weather conditions on sea surface temperature were studied. Data reception delay was analyzed with telex and telephone data terminal experience. Buoys, beacons, transmitters and receivers are described. Battery consumption of the buoys is presented as well as problems of transport, mooring and recovering buoys. Author (ESA)

N85-23880# Quebec Univ., Sainte-Foy. Inst. National de la Recherche Scientifique.
REPORT ON THE PANEL DISCUSSION OF THE WORKSHOP ON DATA COLLECTION PLATFORM NETWORKS c82
Jean-Pierre Fortin *In* CNES Data Collection and Platform Location by Satellite 1980 4 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

Practical aspects of retransmission of environmental data from remote instruments were discussed, to encourage dialog between the user, the operator and the manufacturer, and to promote development of the ideal instrumentation network. Applicable official policies of government agencies, and the need for change were considered. Author (ESA)

N85-23881# Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Service Hydrologie.
THE ARGOS SYSTEM AND HYDROLOGY. RESULTS OBTAINED BY ORSTROM AND BENEFITS OF A DEGREE OF STANDARDIZATION c43
Jacques Callede *In* CNES Data Collection and Platform Location by Satellite 1980 7 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

Hydrological monitoring stations in the White Nile flood plain in Southern Sudan and on the Faleme, a tributary of the Senegal river in Senegal transmit river water level and rainfall data via the ARGOS system. The measured parameters being river water level and rainfall, a degree of standardization as regards the hardware and the processing methods was required. The order in which sensor data are transmitted must be the same. Sensor 1 (water level) has a 16-bit parallel Gray-code output, sensor 2 (rainfall) may have either a 16-bit parallel output (external counting) or a pulse output (internal counting) with the count encoded as a pure binary 16-bit code. This degree of standardization cuts the cost of interfaces and considerably reduces the volume of processing software required, which means less risk of error. This degree of standardization is compatible with readily available equipment. Author (ESA)

N85-23882# Water Survey of Canada, Ottawa (Ontario).
HYDROMETRIC TELEMETRY IN CANADA c17
Ian A. Reid, K. F. Davies (Water Survey of Canada, Calgary, Alberta), and John Clarke (Water Survey of Canada, Halifax, Nova Scotia) *In* CNES Data Collection and Platform Location by Satellite 1980 8 p refs (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

The use of satellite telemetry by the Water Survey of Canada (WSC) for the acquisition of hydrometric and related data is described. All the operational requirements of the WSC can be met through the use of the geostationary GOES or the polar orbiting ARGOS systems. The development of data reception and distribution facilities for GOES and ARGOS data will provide WSC users with the capacity and flexibility needed to meet their demands. Author (ESA)

N85-23883# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
DATA COLLECTION AND PLATFORM LOCATION BY SATELLITE: ARGOS USERS' CONFERENCE
1981 96 p refs Conf. held in Bergen, 3-4 Mar. 1981
Avail: NTIS HC A05/MF A01

The ARGOS system; ARGOS equipment; offshore data collection; ocean circulation; sea surface temperature mapping; iceberg drift; oceanographic uses of ARGOS; and meteorological uses of ARGOS are discussed. For individual titles, see N85-23884 through N85-23893.

N85-23884# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM STATUS REPORT
Jean-Luc Bessis *In its* Data Collection and Platform Location by Satellite 1981 19 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The ARGOS data collection and platform location contribution to the NOAA-TIROS program is reviewed. Of 100 platforms seen during each orbit, 60 are correctly located. Location error is < 100 m. Environmental data collection for atmospheric, oceanographic, and Earth sciences is increasing with each year of system operation. Apart from real time demands for meteorology, it is not possible to meet all user requirements by the sole implementation of direct readout stations. Author (ESA)

N85-23885# Eidsvoll Electronics A.S. (Norway).
EQUIPMENT FOR THE ARGOS SYSTEM FROM EIDSVOLL ELECTRONICS A.S. c33
Ivar Nordby *In* CNES Data Collection and Platform Location by Satellite 1981 3 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

A platform transmitter terminal (PTT), PTT checkout equipment, hydrological station, and ship terminal were developed for the ARGOS system. The PTT features data sampling and digital storage before transmission to avoid radio frequency interference with the sensors. The hydrological station measures snow parameters and wind speed and temperature on a glacier. Author (ESA)

N85-23886# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).
ARGOS VHF DIRECT READOUT MINI-STATION c32
Alain Monier *In* CNES Data Collection and Platform Location by Satellite 1981 5 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

A VHF Direct Readout Mini-Station for the acquisition and processing of data received from ARGOS platforms within a radius of 2000 km was developed. The antenna structure makes it possible to obtain hemispherical coverage with preponderantly circular polarization, and an ellipticity ratio of better than 3dB. The radiation pattern ensures a virtually constant radiation budget irrespective of the angle at which the satellite is seen. Direct satellite experiments demonstrate that data is received satisfactorily as soon as the satellite reaches an angle of elevation of 5 deg. The station is housed in a standard 19' rack 12 units. The stations subassemblies are: receiver, telemetry bit and frame synchronizers, computer and interfaces, supplies. Author (ESA)

N85-23887# Continental Shelf Inst., Trondheim (Norway).
OPERATIONAL EXPERIENCES WITH THE ARGOS SYSTEM IN OCEANOGRAPHY AND OIL SPILL EMERGENCY PLANNING. FUTURE PLANS FOR THE USE OF THE ARGOS SYSTEM AS A COMPONENT IN OFFSHORE DATA COLLECTION SYSTEM c48
Bjorn A. Fossum and Tore Audunson *In* CNES Data Collection and Platform Location by Satellite 1981 7 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The need for and advantages of a satellite transmission system for positioning and ocean data acquisitions are sketched. Author (ESA)

N85-23888# Kiel Univ. (West Germany).
CIRCULATION PATTERN OF THE NORTH ATLANTIC, PART OF THE WARMWATER SPHERE RESEARCH EFFORT AT KIEL UNIVERSITY c48
Wolfgang Krauss and J. Meincke *In* CNES Data Collection and Platform Location by Satellite 1981 10 p refs (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The North Atlantic current system is described. About 30 Sv

of the Gulf Stream waters recirculate south of the Grand Banks towards the Southwest. The remaining 35 Sv follow the bottom topography towards NE. It is expected that 10 Sv turn towards the Azores and the remaining 25 Sv form the North Atlantic Current. As derived from hydrographic sections, this current should pass the North Atlantic Ridge near the Charly-Gibbs-Fracture Zone and should split into several branches east of the ridge. The main branches are the Portugal Current, the Norwegian Current and the Irminger Current. The ARGOS system could study the source area of the North Atlantic current and oceanwide features, but is too expensive. Author (ESA)

N85-23889# Dundee Univ. (Scotland). Physics Lab.
PROPOSED USE OF SYSTEM ARGOS WITH DATA BUOYS FOR CALIBRATION OF THERMAL INFRARED IMAGERY OF NORTH BRITISH WATERS FOR SEA SURFACE TEMPERATURE MAPS c48
Arthur P. Cracknell and S. M. Singh *In* CNES Data Collection and Platform Location by Satellite 1981 8 p refs (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The use of TIROS-N/AVHRR data with an ARGOS platform terminal transmitter to study sea surface temperature is discussed. Simultaneous in-situ calibration data from more than one geographical location are required to improve the statistics; to allow for nonlinearity in atmospheric effects (i.e., temperature differences, as well as the temperatures themselves, are apparently altered by atmospheric effects); to allow for part of the scene, containing a buoy, being under cloud; and to allow for platform equipment failures. Author (ESA)

N85-23890# Iceberg Transport International Ltd. (France). Icebergs for the Future.
THE USE OF THE ARGOS SYSTEM FOR THE STUDY OF THE DRIFT OF ANTARCTIC ICEBERGS c48
Francois Mauviel and Marc Dhalluin *In* CNES Data Collection and Platform Location by Satellite 1981 9 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The ARGOS system was used to study iceberg trajectories. The drift of the icebergs becomes zonal when they reach the 60th parallel. The velocities are between 0.3 and 0.6 kt. The analysis of short period tracks reveals two cases, when the iceberg drifts in pack ice and when it drifts in open sea. The measured iceberg speed was compared with the current velocity given by the drogued buoy. The difference can be imputed to the action of the wind and the swell. This motion constitutes the speed of the iceberg relative to the water. The location calculation error factor is still high owing to the iceberg and current speeds involved, even when very reliable platform terminal transmitters are used. Author (ESA)

N85-23891# Norwegian Meteorological Inst., Blindern.
SOME EXPERIENCE FROM ARGOS STATIONS IN THE OPEN SEA c48
Carl Kolderup Jensen *In* CNES Data Collection and Platform Location by Satellite 1981 6 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

Buoy projects using the ARGOS system are summarized. A meteorological buoy was anchored 200 nautical miles SW of Iceland. Three free drifting First GARP Global Experiment (FGGE) buoys were deployed SW of Iceland. Two free drifting FGGE buoys were deployed in the NE and NW Atlantic. Three ships were equipped with ARGOS stations. Author (ESA)

N85-23892# Swedish Space Corp., Solna.
THE EXPERIENCE OF THE SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE (SMHI) WITH THE ARGOS SYSTEM c47
Thomas Thompson *In* CNES Data Collection and Platform Location by Satellite 1981 10 p (For primary document see N85-23883 14-15)
(PM-U1/81) Avail: NTIS HC A05/MF A01

An experiment using ARGOS for collection of weather observations and positioning of ships; an experiment with ARGOS in mountain areas; and a microcomputer controlled data acquisition terminal with ARGOS satellite communication are described. The ship experiment shows that ARGOS is very efficient in non real time operation, but less satisfactory in real time. The mountain experiment shows that ARGOS can be used with weather stations in regions without electricity or telephones. Author (ESA)

N85-23893# Danish Meteorological Inst., Copenhagen.
APPLICATIONS OF ARGOS DATA COLLECTION SYSTEM FOR AUTOMATIC METEOROLOGICAL OBSERVATORIES IN ARCTIC REGIONS c47
Flemming Jensen *In* CNES Data Collection and Platform Location by Satellite 1981 17 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

The Royal Danish Meteorological Institute agreed to maintain a minimum net of meteorological observations points in Greenland. This obligation is partly fulfilled by automatic observing stations. These stations are on remote locations and the most convenient method to communicate data is by Meteosat and ARGOS data collecting systems. In the most northern part of Greenland geostationary satellites decline below the horizon and only ARGOS can be used. A ground station was established in Greenland to obtain real-time data from the Argos System. Problems related to operating ARGOS platforms in the Arctic are discussed. Author (ESA)

N85-23894# New Mexico State Univ., Las Cruces. Physical Science Lab.
FEASIBILITY STUDY FOR AN AFGL FIBER OPTIC DATA LINK AT WSMR SOUNDING ROCKET LAUNCH AREA
H. L. Shaw and D. F. Terwilliger Hanscom AFB, Mass. AFGL 1 Oct. 1984 23 p
(Contract F19628-82-C-0111)
(AD-A150852; AFGL-TR-84-0292; SR-2) Avail: NTIS HC A02/MF A01 CSCL 16/1

A study was performed to determine the feasibility of installing a fiber optic data link at the White Sands Missile Range (WSMR) to enhance support of sounding rocket launches for the Air Force Geophysics Laboratory. Fiber optic cable and associated hardware were purchased and tested with sample video and telemetry signals. Cost estimates were prepared for the installation of a six-fiber optical cable along various routes between three buildings in the WSMR Sounding Rocket Launch Area. Advantages of the various alternatives are described in sufficient detail so that the most cost-effective alternative can be selected in terms of available funds and mission requirements. The estimated costs for the installation of either a simplex or duplex microwave data link are also provided for comparison with the cost of installing fiber optic links. GRA

N85-23895# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
UTILIZATION OF THE POLAR PLATFORM OF NASA'S SPACE STATION PROGRAM FOR OPERATIONAL EARTH OBSERVATIONS
J. H. McElroy and S. R. Schneider Sep. 1984 76 p refs
(PB85-152502; NOAA/TR/NESDIS-12) Avail: NTIS HC A05/MF A01 CSCL 22B

Principal elements concerning the development of NASA's polar platform are discussed. The utilization of the platform in operational monitoring of the Earth's atmosphere, oceans, and land masses is discussed. The payload for the platform would include instruments derived from the current operational environmental satellites, ocean satellites that will be flown by several countries during the next decade, research programs and land satellite systems -- both governmental and commercial. These instruments may justify two polar-orbiting, Sun-synchronous, astronaut-serviced platforms. The platforms would be at an altitude

in the range from 700 to 900 kilometers and be at two equatorial crossing times, one early in the morning between 8:30 and 10:30 A.M. southbound and the second near noon, perhaps at 1:00 P.M. northbound. GRA

N85-24174# Joint Publications Research Service, Arlington, Va.
MOTION OF SATELLITE WITH TOTAL DYNAMIC SYMMETRY AROUND ROTATING ASPHERICAL EARTH Abstract Only
D. Z. Koyenov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 39 Transl. into ENGLISH from Doki. Akad. Nauk Tadzh. SSR (Dushanbe, USSR), v. 26, no. 6, Sep. 1983 p 355-357 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24349# Centre National d'Etudes Spatiales, Toulouse (France).
IMPROVEMENTS BROUGHT ABOUT TO THE SYSTEM SINCE 1978 AND STATEMENTS ON FUTURE DEVELOPMENT
A. Goasguen *In its* Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 7 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24367# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM MAIN CHARACTERISTICS
J. L. Bessis *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 1-10 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24368# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM AFTER 3 YEARS OPERATION
M. Taillade *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 11-23 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24384# Centre National d'Etudes Spatiales, Toulouse (France).
THE SINKING OF THE LES MUTUELLES DU MANS TRIMARAN
M. Yokel *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 177-180 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24385# Centre National d'Etudes Spatiales, Toulouse (France).
THE SARSAT PROGRAM
D. Ludwig *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 181-191 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24392# National Environmental Satellite Service, Washington, D. C.
ENVIRONMENTAL SATELLITES
Russell Koffler *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 11 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24773 Centre National d'Etudes Spatiales, Toulouse (France).
MISSION ANALYSIS AND ORBIT CONTROL OF THE HELIOSYNCHRONOUS SATELLITE SPOT [ANALYSE MISSION: MAINTIEN ET CHANGEMENT D'ORBITE DE SPOT 1]
H. Cerbelaud *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1985 p 747-809 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24774 Centre National d'Etudes Spatiales, Toulouse (France).
NATURAL REENTRY OF SATELLITES [RENTREE NATURELLE DES SATELLITES]
P. Escudier *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 811-842 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24775 Centre National d'Etudes Spatiales, Toulouse (France).
THE ARGOS PROGRAM [LE PROGRAMME ARGOS]
M. Taillade and D. Ludwig *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 843-864 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-23896*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SHUTTLE PAYLOAD BAY DYNAMIC ENVIRONMENTS: SUMMARY AND CONCLUSION REPORT FOR STS FLIGHTS 1-5 AND 9 Michael OConnell, John Garba, and Dennis Kern 1 Dec. 1984 166 p refs
(Contract NAS7-918)
(NASA-CR-175656; JPL-PUB-84-88; NAS 1.26:175656) Avail: NTIS HC A08/MF A01 CSCL 22B

The vibration, acoustic and low frequency loads data from the first 5 shuttle flights are presented. The engineering analysis of that data is also presented. Vibroacoustic data from STS-9 are also presented because they represent the only data taken on a large payload. Payload dynamic environment predictions developed by the participation of various NASA and industrial centers are presented along with a comparison of analytical loads methodology predictions with flight data, including a brief description of the methodologies employed in developing those predictions for payloads. The review of prediction methodologies illustrates how different centers have approached the problems of developing shuttle dynamic environmental predictions and criteria. Ongoing research activities related to the shuttle dynamic environments are also described. Analytical software recently developed for the prediction of payload acoustic and vibration environments are also described. B.W.

N85-23897*# Chrysler Corp., New Orleans, La. Data Management Services.
SPACE SHUTTLE AEROTHERMODYNAMIC DATA REPORT, PHASE C Report, Jul. - Dec. 1984
10 Jan. 1985 427 p
(Contract NAS9-17179)
(NASA-CR-171858; NAS 1.26:171858; DMS-DFR-2099) Avail: NTIS HC A19/MF A01 CSCL 01A

Space shuttle aerothermodynamic data, collected from a continuing series of wind tunnel tests, are permanently stored with the Data Management Services (DMS) system. Information pertaining to current baseline configuration definition is also stored. Documentation of DMS processed data arranged sequentially and by space shuttle configuration are included. An up-to-date record of all applicable aerothermodynamic data collected, processed, or summarized during the space shuttle program is provided. Tables are designed to provide suvery information to the various space shuttle managerial and technical levels. G.L.C.

N85-23898*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM MISSION REPORT

Michael A. Collins, Jr., A. D. Aldrich, and Glynn S. Lunney Jan. 1984 68 p
(NASA-TM-87456; JSC-19448; NAS 1.15:87456; STS-9) Avail: NTIS HC A04/MF A01 CSCL 22A

The major activities and accomplishments of this first Spacelab mission using Orbiter vehicle 102. The significant configuration differences incorporated prior to STS-9 include the first use of the 3 substack fuel cells, the use of 5 cryo tanks sets and the addition of a galley and crew sleep stations. These differences combined with the Spacelab payload resulted in the heaviest landing weight yet flown. The problems that occurred are cited and a problem tracking list of all significant anomalies tht occurred during the mission is included. Scientific results of experiments conducted are highlighted. A.R.H.

N85-23899*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM MISSION REPORT
Michael A. Collins, Jr., A. D. Aldrich, and Glynn S. Lunney Mar. 1984 39 p
(NASA-TM-87454; JSC-19542; NAS 1.15:87454; STS-41-B) Avail: NTIS HC A03/MF A01 CSCL 22A

The 515-41B National Space Transportation Systems Program Mission Report contains a summary of the major activities and accomplishments of the sixth operational Shuttle flight and fourth flight of the OV-099 vehicle, Challenger. Since this flight was the first to land at Kennedy Space Center, the vehicle was towed directly to the OPF (Orbiter Processing Facility) where preparations for flight STS-41C, scheduled for early April 1984, began immediately. The significant problems that occurred during STS-41B are summarized and a problem tracking list that is a complete list of all problems that occurred during the flight is given. None of the problems will affect the STS 41C flight. The major objectives of flight STS-41B were to successfully deploy the Westar satellite and the Indonesian Communications Satellite-B2 (PALAPA-B2); to evaluate the MMU (Manned Maneuvering Unit) support for EVA (Extravehicular Activities); to exercise the MFR (Manipulator Foot Restraint); to demonstrate a closed loop rendezvous; and to operate the M.R (Monodisperse Latex Reactor), the ACES (Acoustic Containerless Experiment System) and the IEF (Isoelectric Focusing) in cabin experiments; and to obtain photographs with the Cinema 360 Cameras. B.W.

N85-23900*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM MISSION REPORT
Michael A. Collins, Jr., A. D. Aldrich, and Glynn S. Lunney May 1984 18 p
(NASA-TM-87455; JSC-19642; NAS 1.15:87455; STS-41-C) Avail: NTIS HC A02/MF A01 CSCL 22A

The STS 41-C National Space Transportation Systems Program Mission Report contains a summary of the major activities and accomplishments of the eleventh Shuttle flight and fifth flight of the OV-099 vehicle, Challenger. Also summarized are the significant problems that occurred during STS 41-C, and a problem tracking list that is a complete list of all problems that occurred during the flight. The major objectives of flight STS 41-C were to successfully deploy the LDEF (long duration exposure facility) and retrieve, repair and redeploy the SMM (Solar Maximum Mission) spacecraft, and perform functions of IMAX and Cinema 360 cameras.

N85-23901# Weston Observatory, Mass.
SURFACE PRESSURE PRODUCED BY SPACE TRANSPORTATION SYSTEM FLIGHT 41B Technical Report, Nov. 1983 - Mar. 1984
F. A. Crowley, E. B. Hartnett, and M. A. Fisher 1 Aug. 1984 66 p
(Contract F19628-84-C-0011)
(AD-A150793; AFGL-TR-84-0213; SR-1) Avail: NTIS HC A04/MF A01 CSCL 22/4

There is a need to measure and analyze the vibro-acoustic environment of Space Transportation System (STS) launches in order to forecast and verify facility design and lifetime predictions for STS operations at Vandenberg Air Force Base (VAFB), and to accumulate flight vehicle performance data. Earlier measurements at Kennedy Space Center (KSC) pointed to an azimuthal dependence in the overall sound power level (OASPL) for STS launches. The immediate aim of this effort is to clarify the azimuthal properties of surface pressure around the time of the OASPL maximum for KSC launches. The study helps define and locate a site insensitive STS source pressure equivalent essential to vibro-acoustic forecasts at VAFB. The dense watercloud produced by STS main engine firing at KSC attenuates surface pressure levels directly south of Pad 39A by as much as 14 dB. Spectra at stations under the cloud are lower in level and frequency content than those in the clear. The phase velocity for acoustics early in the launch is insensitive to watercloud effects for stations at 300 meters. Spatial coherence of the pressure field is degraded between stations 100 meters or more apart. GRA

N85-24404# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS CONTRIBUTION TO THE DEMONSTRATION OF THE EFFECTIVENESS OF A SATELLITE-BASED SEARCH AND RESCUE SYSTEM
R. Rolland *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 10 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24776 Centre National d'Etudes Spatiales, Toulouse (France).
THE SARSAT/COSPAS SYSTEM FOR ASSISTING SATELLITE BASED SEARCH AND RESCUE [SARSAT/COSPAS, UN SYSTEME D'AIDE A LA RECHERCHE ET AU SAUVETAGE PAR SATELLITE]
D. Ludwig and Ph. Goudy *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 865-874 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-23882# Water Survey of Canada, Ottawa (Ontario).
HYDROMETRIC TELEMETRY IN CANADA
Ian A. Reid, K. F. Davies (Water Survey of Canada, Calgary, Alberta), and John Clarke (Water Survey of Canada, Halifax, Nova Scotia) *In* CNES Data Collection and Platform Location by Satellite 1980 8 p refs (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-24364# National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
TRACKING PELAGIC DOLPHINS BY SATELLITE
Jacqueline G. Jennings and Raymond K. Stives *In* CNES Proc. of the ARGOS Users Conf. on Data Colection and Platform 1981 6 p refs (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24365# British Columbia Univ., Vancouver. Faculty of Forestry.
POLAR BEAR TELEMETRY RESULTS FROM THE NIMBUS-6 SYSTEM
Mitchell K. Taylor, D. P. DeMaster, S. P. Sheldon, F. Sorenson, P. B. Latour, J. Lee, R. E. Schweinsburg, T. Larsen, C. Jonkel, and C. Vibe *In* CNES Proc. of the ARGOS Users Conf. on Data

Collection and Platform 1981 26 p refs Sponsored by US Fish and Wildlife Service National Laboratory, Minnesota University, Canadian Wildlife Service, Northwest Territories Wildlife Service, Norsk Polar Instituut and Danish Zoologisk Museum (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24402# Woods Hole Oceanographic Institution, Mass.
TELEMETERED METEOROLOGICAL AND ENGINEERING DATA FROM A DEEP SEA MOORED BODY IN THE LONG TERM UPPER OCEAN STUDY (LOTUS)
Clara Deser *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24419# Magnavox Electronic Systems Co., Fort Wayne, Ind.
THE DATA ACQUISITION CONTROL AND TELEMETRY (DACT) SYSTEM
W. H. Serstad *In* CNES Data Collection and Platform Location by Satellite 1984 11 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24777 Belgian Royal Observatory, Uccle.
THE TRANSIT AND GLOBAL POSITIONING SYSTEM (GPS) SYSTEMS. PRECISION NAVIGATION AND LOCALIZATION [LES SYSTEMES TRANSIT ET GPS. NAVIGATION ET LOCALISATION DE PRECISION]
M. P. Paquet *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 875-904 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24781* Orbital Sciences Corp., Vienna, Va.
INTERPLANETARY NAVIGATION
James R. Stuart *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1015-1038 refs (For primary document see N85-24753 14-59)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 17B

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-23902 Purdue Univ., Lafayette, Ind.
MODEL AND CONTROLLER REDUCTION OF UNCERTAIN SYSTEMS USING COVARIANCE EQUIVALENT REALIZATIONS Ph.D. Thesis
David Arnold Wagie 1984 228 p
Avail: Univ. Microfilms Order No. DA8500451

A theory to design a controller that is of smaller dimension than the original system, and the parameters of the system are considered uncertain. The general approach is to use a projection technique for system reduction which provides a reduced system that matches output covariances and Markov parameters of the original system. This technique preserves the mean-squared values of the system outputs, and important property since most performance specifications are given in terms of maximum mean-squared output values. A concise theoretical development of the proposed projection approach to system reduction is provided and its application for model and controller reduction of both continuous and discrete systems is discussed. This technique is then used to design a reduced sensitivity controller for a continuous time system with uncertain parameters. Dissert. Abstr.

N85-23903*# California Univ., Los Angeles.
A MATHEMATICAL FORMULATION OF THE SCOLE CONTROL PROBLEM, PART 1
A. V. Balakrishnan May 1985 43 p refs
(Grant NAG1-464)
(NASA-CR-172581; NAS 1.26:172581) Avail: NTIS HC A03/MF A01 CSCL 22B

A mathematical formulation of the SCOLE control problem in terms of a continuous model described by partial differential equations with delta functions on the boundary is presented along with three techniques of solution. The abstract wave equation approach leads immediately to a linear feedback law that can ensure (strong) stability. The boundary control approach yields an explicit solution, albeit in a simple case. Author

N85-23904*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LINEARIZATION OF DIGITAL DERIVED RATE ALGORITHM FOR USE IN LINEAR STABILITY ANALYSIS
Ronald E. Graham and Theodore W. Porada 21 Jun. 1985 13 p refs Proposed for presentation at 4th Am. Control Conf., Boston, 19-21 Jun. 1985
(NASA-TM-87000; E-2522; NAS 1.15:87000) Avail: NTIS HC A02/MF A01 CSCL 22B

The digital derived rate (DDR) algorithm is used to calculate the rate of rotation of the Centaur upper-stage rocket. The DDR is highly nonlinear algorithm, and classical linear stability analysis of the spacecraft cannot be performed without linearization. The performance of this rate algorithm is characterized by a gain and phase curve that drop off at the same frequency. This characteristic is desirable for many applications. A linearization technique for the DDR algorithm is investigated. The linearization method is described. Examples of the results of the linearization technique are illustrated, and the effects of linearization are described. A linear digital filter may be used as a substitute for performing classical linear stability analyses, while the DDR itself may be used in time response analysis. Author

N85-23905# European Space Agency, Paris (France).
THE GIOTTO SPACECRAFT IMPACT-INDUCED PLASMA ENVIRONMENT
Erica Rolfe, ed. and Bruce Battrick, ed. Sep. 1984 111 p refs Proc. of Giotto Plasma Environ. Working Group (PEWG) Meeting, Bern, 10-12 Apr. 1984
(ESA-SP-224; ISSN-0379-6566) Avail: NTIS HC A06/MF A01

Models of the Halley dust, neutral gas, and plasma environments; dust impact ionization; neutral gas and ion impact ionization; and spacecraft charging are discussed. The behavior of sensors and protective coatings during the Giotto mission is considered. For individual titles, see N85-23906 through N85-23921.

N85-23906# Austrian Research Center, Seibersdorf.
MEASUREMENT OF CHARGED SECONDARY PARTICLE EMISSION UNDER ION AND NEUTRAL IMPACT
F. G. Ruedenauer and W. Steiger *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 1-10 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

Secondary electron and ion emission yields and energy distributions from Giotto outer surface materials under ion and neutral impact at Giotto flyby velocities were determined to simulate spacecraft charging during the Halley encounter. Bombarding species were N2+, Ar+, Sn+, Xe+ (ions) and Ar, Xe (neutrals). Sample materials were Al alloy 6061T6 and PCB7 white paint. Author (ESA)

N85-23907# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
CONTACTLESS DETERMINATION OF THE CONDUCTIVITY OF

THE WHITE PAINT PCB-Z c27

H. Arends and R. Schmidt *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 11-14 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

A method to measure the conductivity of the white paint used on the Giotto spacecraft dust shield was developed for use in a model of spacecraft/plasma interaction during Halley's comet fly-by. The method measures conductivity without mechanical contacts in vacuo. Painted targets were exposed to a beam of low energy electrons. The current through the target was measured at different bias potentials. The current-voltage characteristics of painted samples were compared with one of an aluminum anode of identical dimensions. The differences between the characteristics for aluminum and paint are used to derive resistances at a given potential drop through the barely conductive top coat. An average resistivity of 10 billion ohmcm, area resistance of 10 million ohm/sqcm, and sheet resistance of 10 to the 13th power ohm are obtained. Author (ESA)

N85-23908# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.

MEASUREMENTS OF INTEGRAL YIELDS OF CHARGED SECONDARYBAD CAPS LANGUAGE[y] PARTICLES USING NEUTRAL BEAMS SIMULATING A COMETARY FLY-BY c72

R. Schmidt and H. Arends *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 15-19 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

Atomic and molecular beams bombarded surfaces covered with gold, aluminum and white conductive paint PCB-Z to provide input parameters for a model of plasma-spacecraft interactions during the Giotto Halley's comet fly-by mission. The targets were treated and cleaned similarily to the real spacecraft, i.e., the surfaces were not chemically clean. The average yield, derived using all gases at their respective ram energy on aluminum and PCB-Z, is 20% for secondary electrons and 0.4% for ions.

Author (ESA)

N85-23909# Engineering System International, Rungis (France).

GIOTTO RESIDUAL IONIZATION

F. Arnaudeau, A. deRouvray, and G. Winkelmuller *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 21-37 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

The residual fractional ionization of the plasma resulting from the impact of foamed silica dust particles of different mass on the Giotto spacecraft front shield was investigated. The hydrodynamic of the impact is solved by an arbitrary Lagrangian Eulerian technique (ALE) and an explicit time integration scheme with a finite element code. The ALE provides the evolution of pressure, temperature and density in the whole plasma cloud. Local thermodynamic equilibrium processes are effective throughout most of the plasma evolution. Residual ionization maximum number is 0.5 for the smallest particle. Less ionization is obtained when the particle is compact. There are virtually no residual ions from the shield. Perforating particles have time for almost complete recombination. Author (ESA)

N85-23910# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).

IMPACT IONIZATION FROM GOLD, ALUMINUM AND PCB-Z c72

E. Gruen *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 39-41 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

Impact ionization yields of gold, bare aluminum, and PCB-Z conductive paint, used on the Giotto spacecraft front surface, were measured in a dust accelerator. Iron projectiles with masses between 10 to the minus 15th and minus 10th powers g, and speeds 2 to 50 km/sec were shot onto targets made from these materials. The highest speeds were reached for the smallest particles. The charge yields (no. of electrons or ions emitted/no. of projectile atoms) range from 0.09 for PCB-Z over 0.47 for aluminum to 4.7 for gold. These values apply to an impact speed of 68 km/sec and projectile masses of 10 to the minus 15th power g. Author (ESA)

N85-23911# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).

EXPERIMENTAL INVESTIGATIONS ON ION EMISSION WITH DUST IMPACT ON SOLID SURFACES

F. R. Krueger and J. Kissel *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 43-48 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

Ion types, energy, and angular distributions of ions produced in dust particle impact simulations of the Giotto spacecraft Halley's comet encounter are reported, and semiempirical yield formulas are given. Results show that dust impact is the largest contribution to ion formation at the spacecraft surfaces during Halley encounter. The yield of ions formed by atomic and molecular impacts is comparably small. Due to the painted surface on the shield, negative ions are also formed. The number of electrons produced by dust and molecular impact together is less than expected, because in dust impact only a few residual electrons are liberated. This may be compensated by a higher electron production by molecular impacts and by light irradiation. However, the total electron yield, though probably less than the negative ion yield, is still large enough to govern the plasma properties due to the large mobility of the electrons. Author (ESA)

N85-23912# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).

ION EMISSION FROM SOLID SURFACES: COMPARISON OF DUST IMPACT WITH OTHER EXCITATIONS

F. R. Krueger *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 49-54 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

The excitation functions of cometary dust particles impinging on a spacecraft shield were studied by simulating dust impact in a dust accelerator. The results are compared with those of ionization by short laser pulses applied to solid material, and other methods. Laser irradiation proves to be more effective in ionization compared with dust impact, which is more effective in cratering. Dissipation densities and material qualities are important, but residual ionization also depends on the area of excitation being proportional to the particle or focal diameter. This may be true for the energy distribution of the produced ions. Consequences for charging spacecraft in a dust coma are discussed. Author (ESA)

N85-23913# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).

ELECTROSTATIC CHARGING OF THE GIOTTO SPACECRAFT DUE TO NEUTRAL GAS IMPACT

H. Maassberg *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 55-58 refs (For primary document see N85-23905 14-18)

Avail: NTIS HC A06/MF A01

Stationary charging of Giotto spacecraft is discussed. Close to comet Halley nucleus, floating potential is mainly determined by emission alone and ambient plasma is of minor importance. For very small ion yield, strongly increased floating potentials must be expected. Away from the nucleus, the balancing of electron currents yields a floating potential nearly independent of secondary ion emission properties. Potential barrier and electric field at the surface are strongly influenced by ion yield and the part of high energy component in emitted ion distribution. High values of floating potential are expected if a significant high energy tail in emitted electron distribution function exists. The greatest uncertainty in expected potential structure arises from the value of ion yield; potential maxima monotonic potentials occur in the calculations. However, secondary emission due to neutral gas impact

gives stationary floating potentials that are expected to be positive. Author (ESA)

N85-23914# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
A MODEL OF PLASMA CLOUD EXPANSION GENERATED BY A DUST PARTICLE IMPACT c75
H. Maassberg *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 59-63 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

A model to estimate the electric potential of an expanding plasma cloud and the influence of released electrons on the floating potential of Giotto was developed. Approximations reveal uncertainties in the magnitude of expected pulses in floating potential. According to the model, pulse magnitude strongly depends on the thermal energy of plasma cloud electrons and on the shielding length of ambient plasma. However, uncertainties exist in ambient plasma parameters, especially in the effect of the strong secondary emission due to neutral gas impact. Little is known about the electron temperature of the expanding plasma cloud. In the worst case, potential pulses of tens of volts lasting up to a few millisec are expected, especially close behind the bow shock of comet Halley. Closer to the nucleus, potential variations in the probe's environment and floating potential pulses decrease in magnitude, but increase in frequency. Author (ESA)

N85-23915# Parker (Lee W.), Inc., Concord, Mass.
GIOTTO PLASMASHEATH AND WAKE CHARGING NEAR HALLEY'S COMET: REVISED PARAMETERS c75
Lee W. Parker *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 65-69 refs Sponsored by ESA (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

Giotto spacecraft charging and electrostatic fields caused by impact-generated plasma emitted from the Giotto bumper shield at 600 to 1000 km from Halley's comet are estimated. Results indicate that Giotto will not charge significantly above +25 V. The wake surface charges to a high negative potential of -450 V. The wake-surface charge does not influence the emitted ions and is not discharged by them. Near the side surface there is a disturbed population of ambient ions (no impact-generated ions reach the side surface). Near the forward half of the side surface, the electron population is dominated by the impact-generated electrons. Near the rearward half there are no electrons because of the highly-negative wake surface. A tilt of the solar array surfaces toward the wake direction could result in their charging to high negative potentials. Author (ESA)

N85-23916# Physikalisch-Technische Studien G.m.b.H., Freiburg (West Germany).
SIMULATIONS OF SATELLITE-PLASMA INTERACTION, INCLUDING ELECTRON SPACE CHARGES
H. Thiemann *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 71-79 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

The time history of the generation of secondary ions and electrons forming a plasma cloud around the Giotto spacecraft was simulated with a two dimensional particle-in-cell code, using realistic electron and ion fluxes from the upper surface of a cylindrical body. A quasisteady state of the system is reached on an ion time scale, determined by the high ion density just above the emitting surface, creating a potential barrier. The relatively small ion plasma period allows simulations with real aluminum ion mass. The calculations show the formation of an electron cloud around the body whereas ions distribute in a wake-like structure. The surface potential depends on the fluxes and kinetic energy of the particles. It typically ranges up to several tens of volts.
Author (ESA)

N85-23917# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
ANTICIPATED IMPACT PLASMA PROBLEMS FOR THE COPERNIC-RPA EXPERIMENT IN THE COMETARY ENVIRONMENT c75
C. dUston and H. Reme *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 81-86 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

Spacecraft-plasma interactions during the flight through the cometary environment at a very high relative velocity that may influence the charged particle measurements by the Copernic-RPA experiment onboard Giotto in the last 2 min of the mission are considered. The most sensitive areas are the electrostatic environment of Giotto and the secondary particle population. It is necessary to simulate the trajectories of the particles coming into the detectors in order to know their distortion by the electrostatic environment of Giotto. The secondary electrons and ions should not mask the spectrum of the cometary plasma, even though they may contaminate the low energy part. Direct impact of dust onto the exposed portion of the detectors has very little chance of occurring. Indirect effects of heavy dust impact on the bumper shield may produce anomalies in the performances of the instruments but will not destroy them. Author (ESA)

N85-23918# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
AN IMPACT PLASMA MONITOR FOR COMETARY MISSIONS c75
R. Grard *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 87-88 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

A device to detect the emission of plasma associated with high velocity impacts of molecules (70 km/sec), a source of interference for the experiments which study the neutral and ionized gas environment of Comet Halley, was developed. The impact plasma monitor will detect this effect on-board Giotto, VEGA-1 and VEGA-2 by measuring the saturation current of secondary electrons extracted from the surface of a probe exposed to the molecular bombardment. It is expected that these in-situ observations will complement the information obtained from theory and laboratory investigations and help to characterize the immediate vicinity of the spacecraft during their flyby through the cometary coma. Author (ESA)

N85-23919# Bern Univ. (Switzerland).
PLASMA ENVIRONMENT EFFECTS ON THE GIOTTO ION MASS SPECTROMETER c75
R. Goldstein *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 89-90 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

Spacecraft-environment interactions relative to the performance of the Giotto Ion Mass Spectrometer (IMS) are discussed. Ion trajectory distortions due to space charge regions forward of the spacecraft do not seriously disturb the measurements of IMS-1, but may affect IMS-2, which looks in the forward direction. Charging of the spacecraft itself can distort ion spectra measured by both sensors. Intercomparison of data from other instruments may allow estimation of the amount of charging and therefore the extent of distortion. Author (ESA)

N85-23920# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Scientific Program Dept.
THERMAL DESIGN OF THE GIOTTO SPACECRAFT
F. Felici and P. LoGalbo *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 91-98 (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

The thermal design adopted for the Giotto spacecraft to overcome the problems of varying solar flux, a large range of solar aspect angles, and differing internal power dissipation is

described. Thermal control is based on an internal enclosure housing all equipment and payloads, isolated from space and from the kick motor. Dust shields are decoupled radiatively and conductively from the spacecraft main body. The main radiator is an annular honeycomb panel under the high gain antenna at the top of the spacecraft. Skirt radiators are distributed around the outer panels between the main and the experiment platform. Inside the enclosure, the highly dissipating TXT's and reaction control equipment are isolated. Author (ESA)

N85-23921# Los Alamos Scientific Lab., N. Mex. Space Plasma Physics Group.
SPACECRAFT ENVIRONMENT DURING THE GIOTTO-HALLEY ENCOUNTER: A SUMMARY
D. T. Young *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 99-104 refs Sponsored by US Department of Energy (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

Models of the Halley dust, neutral gas, and plasma environments; dust impact ionization; neutral gas and ion impact ionization; and spacecraft charging are discussed. Author (ESA)

N85-23922# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS 11 (ACTIVE CONTROL OF SPACE STRUCTURES) Interim Report, May - Oct. 1983
T. H. Brooks, D. B. Kasle, T. C. Henderson, J. P. Govignon, and F. N. R. Ayer Griffiss AFB, N.Y. RADC Sep. 1984 272 p
(Contract F30602-81-C-0180; ARPA Order 3655; AF Proj. C655)
(AD-A150639; CSDL-R-1687; RADC-TR-84-185) Avail: NTIS HC A12/MF A01 CSCL 22/2

The overall objective of the Simulation Extension Project is to identify and quantify those generic missing scenario and sensor parameters (as well as their interactions) which drive the performance of the space-based storing IR surveillance systems. The approach taken to achieve this overall objective has proceeded along two main avenues: Simulation Enhancements; and Simulation Applications. During the current reporting period, the Simulation Enhancements effort has concentrated in three areas: continuation of the Generic Scene Simulation development; enhancements to the Signal Processor Simulation; and expansion of the capabilities of the Integrated Large Space Structures Simulation. The Simulation Applications effort has been focused most recently on simulation and evaluation of algorithms for line-of-sight jitter reduction. Within the framework of the ROFT (Rapid Optics Fabrication Technology) program, the characterization of materials for large space mirrors is obtained by examining the impact of material properties on the performance of mirrors. The study recognizes major differences for material requirements between IR systems and laser applications. Research in active structural control encompasses design of reduced-order controllers for vibration suppression; development of approaches to system parameter identification; and generation of large-angle slew maneuvers. In this report, theoretical advances and demonstrations in the first two categories are presented. A scientific experiment to examine the process of synthesizing feedback controllers for precision pointing of a passive optical system in a wideband disturbance environment is continued. GRA

N85-23923# Integrated Systems, Inc., Palo Alto, Calif.
ADAPTIVE TECHNIQUES FOR CONTROL OF LARGE SPACE STRUCTURES Final Report, 1 Jun. 1983 - 31 May 1984
R. L. Kosut and M. G. Lyons Dec. 1984 141 p
(Contract F49620-83-C-0107)
(AD-A150957; AFOSR-85-0078TR) Avail: NTIS HC A07/MF A01 CSCL 22/2

This report is a collection of published papers reporting on research supported by AFOSR. These papers deal primarily with theoretical aspects of adaptive control of systems which cannot be precisely modeled, e.g., unmodeled dynamics and disturbances. These latter characteristics are fundamental issues in adaptive (and nonadaptive) control design for large space structures (LSS). Some of the general topics covered include: LSS modeling and model error, decentralized control, robust adaptive control, global stability, local stability, and persistent excitation. GRA

N85-24766 Centre National d'Etudes Spatiales, Toulouse (France).
MODELING NEEDED FOR THE DESIGN AND DEFINITION OF SPACECRAFT ATTITUDE AND ORBIT CONTROL SYSTEMS [MODELISATIONS NECESSAIRES A LA CONCEPTION ET LA DEFINITION DES SYSTEMES DE COMMANDE D'ATTITUDE ET D'ORBITE DES VEHICULES SPATIAUX]
Paul Duchon *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 501-535 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-23924*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ALTERNATE NOZZLE ABLATIVE MATERIALS PROGRAM
N. A. Kimmel 1 Sep. 1984 225 p refs Prepared in cooperation with Morton Thiokol
(Contracts NAS8-30490; NAS7-918)
(NASA-CR-175658; JPL-PUB-84-58; NAS 1.26:175658) Avail: NTIS HC A10/MF A01 CSCL 21H

Four subscale solid rocket motor tests were conducted successfully to evaluate alternate nozzle liner, insulation, and exit cone structural overwrap components for possible application to the Space Shuttle Solid Rocket Motor (SRM) nozzle assembly. The 10,000 lb propellant motor tests were simulated, as close as practical, the configuration and operational environment of the full scale SRM. Fifteen PAN based and three pitch based materials had no filler in the phenolic resin, four PAN based materials had carbon microballoons in the resin, and the rest of the materials had carbon powder in the resin. Three nozzle insulation materials were evaluated; an aluminum oxide silicon oxide ceramic fiber mat phenolic material with no resin filler and two E-glass fiber mat phenolic materials with no resin filler. It was concluded by MTI/WD (the fabricator and evaluator of the test nozzles) and NASA-MSFC that it was possible to design an alternate material full scale SRM nozzle assembly, which could provide an estimated 360 lb increased payload capability for Space Shuttle launches over that obtainable with the current qualified SRM design. B.W.

N85-23925*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME OBSERVATIONS OF HEATED GALLIUM ARSENIDE HETEROFACE SOLAR CELLS
Wilfred J. Friesen Mar. 1985 53 p refs
(NASA-TM-86388; NAS 1.15:86388) Avail: NTIS HC A04/MF A01 CSCL 14B

GaAlAs/GaAs heteroface solar cells used in space offer advantages of higher operating temperatures and recovery from radiation damage using thermal annealing. Experiments were conducted to examine the effects on the room temperature photovoltaic properties of cells due to heating in a vacuum at

temperatures encountered in radiation damage annealing. Some degradation of photovoltaic properties was observed for all the cells that were heated. The lifetime, due to heating, for a 20-percent degradation in output power was estimated for cells heated at 200 C and 400 C. The results for cells that were heated at 200 C for 1750 hours indicate a lifetime of at least 3 years. The results for cells that were heated at 400 C for 264 hours indicate that lifetimes in the range of 350 hours to 1400 hours may be expected. The results indicate that for cells that must be heated at 400 C the selection of fabrication techniques and materials is particularly important. Author

N85-23926*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FABRICATION OF CERAMIC SUBSTRATE-REINFORCED AND FREE FORMS
R. J. Quentmeyer, G. McDonald, and R. C. Hendricks 19 Apr. 1985 26 p refs Presented at 12th Intern. Conf. on Met. Coatings, Los Angeles, 15-19 Apr. 1985; sponsored by American Vacuum Society
(NASA-TM-86994; E-2540; NAS 1.15:86994) Avail: NTIS HC A03/MF A01 CSCL 21H

Components fabricated of, or coated with, ceramics have lower parasitic cooling requirements. Techniques are discussed for fabricating thin-shell ceramic components and ceramic coatings for applications in rocket or jet engine environments. Thin ceramic shells with complex geometric forms involving convolutions and reentrant surfaces were fabricated by mandrel removal. Mandrel removal was combined with electroplating or plasma spraying and isostatic pressing to form a metal support for the ceramic. Rocket engine thrust chambers coated with 0.08 mm (3 mil) of ZrO2-8Y2O3 had no failures and a tenfold increase in engine life. Some measured mechanical properties of the plasma-sprayed ceramic are presented. B.G.

N85-23927# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
COUPLING BETWEEN VELOCITY OSCILLATIONS AND SOLID PROPELLANT COMBUSTION Final Report, 15 Mar. 1983 - 15 Aug. 1984
R. S. Brown, A. M. Blackner, P. G. Willoughby, and R. Dunlap Aug. 1984 145 p
(Contract F49620-81-C-0027)
(AD-A151081; CSD-2749-AR-3; AFOSR-85-0100TR) Avail: NTIS HC A07/MF A01 CSCL 21/8

Studies are being conducted to define and characterize the basic fluid mechanics and heat transfer mechanism controlling the coupling between acoustic and radial profiles of the mean and oscillatory velocity are being measured at several axial stations in a cold flow rocket simulator. Recent studies have concentrated on measuring the structure of the acoustic waves and how this structure relates to the oscillatory heat flux data reported earlier. In particular, the radial profiles of the magnitude and phase (relative to the head end acoustic pressure) of the acoustic velocity have been measured at several axial stations. At low acoustic pressures (i.e., 0.05%) the acoustic waves extend across the entire cross-section in the region upstream of the transition in the mean velocity profile. Nonplaner and nonlinear behavior is also observed in the near surface regions. Downstream of the velocity transition, the acoustic waves do not penetrate through the near wall turbulence. At higher acoustic pressures (i.e., 0.4%) the upstream nonlinearities increase in magnitude and extend across the entire port. Downstream of the velocity transition the core nonlinearities decay while the linear component penetrates through the turbulence to the wall. GRA

N85-23928# Argonne National Lab., Ill.
MIXING, CHEMICAL REACTION AND FLOW FIELD DEVELOPMENT IN DUCTED ROCKETS
S. P. Vanka, R. R. Craig, and F. D. Stull 1985 11 p refs Presented at 21st AIAA/ASME/SAE Joint Propulsion Conf., Monterey, Calif., 8 Jul. 1985
(Contract W-31-109-eng-38)
(DE85-004083; CONF-850712-3) Avail: NTIS HC A02/MF A01

The characteristics of the three-dimensional reacting flow field in ducted rocket configurations were studied. Equations governing the fully-elliptic three-dimensional reacting flow have been solved numerically by an iterative finite-difference algorithm. For simplicity, the combustion process is assumed to occur in a one-step fast chemical reaction, represented as 1 kg fuel + i kg oxidant = (1 + i) kg products, where i is the stoichiometric oxidant-to-fuel ratio. The effects of turbulence are represented through a turbulence model in which a scalar eddy viscosity is calculated from two local turbulence variables. The (k approx. epsilon) turbulence model has been used and partial differential equations are solved for the transport of the kinetic energy of turbulence, k, and its dissipation rate, epsilon. Calculations also have been made for different geometrical parameters to study their influence on flow field development and mixing efficiency. The detailed three-dimensional flow fields, temperature contours and fuel distributions and the effects of various geometrical parameters are discussed. DOE

N85-24185# Joint Publications Research Service, Arlington, Va.
IGNITION, SEPARATION OF BOOSTERS, STAGES IN ARIANE 3
Goetz Wange *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 5-7 refs Transl. into ENGLISH from Flugrevue (Munich), Dec. 1984 p 27 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-23929*# National Aeronautics and Space Administration, Washington, D. C.
PREPARATIONS OF METHOXYNITROPHENAZINES AND THEIR PHOTOCONDUCTIVITIES
Akira Sugimoto, Kenji Inoue, Hiroo Inoue, and Eiji Imoto Jan. 1985 13 p refs Transl. into ENGLISH from Nippon Kagaku Kaishi (Japan), v. 7, 1974 p 1294-1298 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77775; NAS 1.15:77775) Avail: NTIS HC A02/MF A01 CSCL 07A

Eight methoxynitrophenazines with a methoxy group at the 1 or 2 position and a nitro group at the 6-, 7-, 8- or 9-position of the phenazine ring [1,6], [1,7], [1,8], [1,9], [2,6], [2,7], [2,8] and [2,9] were prepared and their photocurrents were measured by illuminating the surface-type cell with white light from a W lamp under a N atmosphere at room temp. The photocurrents of 1-nitrophenazine [6] and 2-nitrophenazine [7] are compared with those of the methoxynitrophenazines. The photocurrent (i sub p) increases with increasing light intensity (I), thus satisfying log i varies as n log I. The n values are 0.5-1.0. When the nitro group is located at the beta-position of the phenazine ring, the photocurrent becomes larger owing to the electron withdrawing property of the nitro group. On the other hand, the photocurrents of phenazines with the nitro group at the Alpha-position are extremely small. The photoconductivities of methoxynitrophenazines are lower in air. Author

24 COMPOSITE MATERIALS

Includes laminates.

N85-23930 Purdue Univ., Lafayette, Ind.
A STUDY OF FREQUENCY EFFECTS AND DAMAGE ACCUMULATION DURING THE FATIGUE OF GRAPHITE/EPOXY AND

GLASS/EPOXY COMPOSITE MATERIALS Ph.D. Thesis
Gwo-Chung Tsai 1984 168 p
Avail: Univ. Microfilms Order No. DA8500447

Fatigue tests were conducted on [+ or - 45] (2s) layups using 0.05, 0.5 and 5 Hz frequencies. Basically the fatigue life increased as the loading frequency increased. Experimental results show that the initial dynamic modulus of the composites is larger for glass/epoxy and graphite/epoxy composite laminates at high frequency. A nonlinear damage accumulation model is developed to describe the material properties degradation and predict the fatigue life at different stresses and frequencies. The frequency does not enter the model explicitly but only through the frequency effect on the initial modulus. The behavior of the dynamic strain and cyclic creep strain were tested as measures of fatigue damage. Dissert. Abstr.

N85-23931*# Auburn Univ., Ala. Dept. of Mechanical Engineering.
MEASUREMENT OF DAMPING OF GRAPHITE EPOXY MATERIALS Progress Report, 1-31 Mar. 1985
M. J. Crocker 1 Apr. 1985 11 p refs
(Contract NAS8-36146)
(NASA-CR-175663; NAS 1.26:175663; PR-6) Avail: NTIS HC A02/MF A01 CSCL 11D

The design of an experiment to measure the damping of a cylindrical graphite-epoxy specimen with a three point support and a knife edge support is described as well as equipment used in tests conducted to determine the influence of the support at the two ends of the specimen and to simulate an idealized free-free boundary condition at the two edges. A curve fitting technique is being used to process the frequency response data obtained. Experiments conducted on the thin plate specimen also reveal the influence of the end support condition on the damping ratio of the specimen. The damping ratio values measured for both specimens appear to be strongly influenced by the shape of the specimen and appear to depend on length and fiber orientation as well as the presence of discontinuities such as sharp bends, corners, and notches. A.R.H.

N85-23932*# National Aeronautics and Space Administration, Washington, D. C.
SOME FEATURES OF THE FABRICATION OF MULTILAYER FIBER COMPOSITES BY EXPLOSIVE WELDING
V. A. Kotov, A. N. Mikhaylov, and D. Cabelka Apr. 1985 8 p refs Transl. into ENGLISH of Conf. Paper from Slovenska Akademia Vied, Bratislava p 79-84 Presented at the 5th Intern. Symp. on Composite Metallic Mater., Smolenice, Czechoslovakia, 8-11 Nov. 1983 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-77844; NAS 1.15:77844) Avail: NTIS HC A02/MF A01 CSCL 11D

The fabrication of multilayer fiber composites by explosive welding is characterized by intense plastic deformation of the matrix material as it fills the spaces between fibers and by high velocity of the collision between matrix layers due to acceleration in the channels between fibers. The plastic deformation of the matrix layers and fiber-matrix friction provide mechanical and thermal activation of the contact surfaces, which contributes to the formation of a bond. An important feature of the process is that the fiber-matrix adhesion strength can be varied over a wide range by varying the parameters of impulsive loading. Author

N85-23933# Kaman Tempo, Santa Barbara, Calif.
MMCIAC (METAL MATRIX COMPOSITES INFORMATION ANALYSIS CENTER) Annual Report, No. 4, 1 Oct. 1983 - 30 Sep. 1984
L. A. Gonzalez Oct. 1984 82 p
(Contract DLA900-80-C-4095)
(AD-A150654; KT-85-002(R)) Avail: NTIS HC A05/MF A01 CSCL 11/4

This report reviews the continuing operations and progress of the Metal Matrix Composites Information Analysis Center for the fourth quarter of fiscal year 1984 and for the annual fiscal period of 1 October 1983 through 30 September 1984. Activities and coverage of the Center are discussed in terms of major work areas: acquisition, products and service, current awareness, promotion, special studies, and management. Future plans and growth forecasts for the Center are also presented. GRA

N85-23934# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
MONITORING OF LAMINATE CURE WITH MICRODIELECTROMETRY Technical Report, 1 May - 30 Nov. 1984
W. W. Bidstrup, N. F. Sheppard, Jr., and S. D. Senturia 30 Nov. 1984 15 p
(Contract N00014-84-K-0274)
(AD-A150863; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/4

We report the use of microdielectrometry for monitoring the cure of the matrix resins in epoxy-glass and epoxy-graphite composites. The multi-ply laminates are cured in a press using ramped temperatures. The microdielectrometer sensor is embedded in a cavity made by cutting a hole in each of the inner plies. For a brominated-epoxy glass-reinforced prepreg ramped to final cure temperatures as high as 200 C and at pressure up to 60 psi, a reproducible pattern of cure events is observed beginning with the flow of resin onto the sensor electrodes and ending with the characteristic stabilizing of the loss factor late in cure. The apparent dielectric properties (permittivity and loss factor) show good reproductibility for identically prepared samples, but their characteristics differ from those observed in neat resin. For an MY-720 based graphite prepreg, at cure temperatures below 160 C and at pressures up to 60 psi, features in the cure data are similar to what is seen in epoxy glass. However, at pressures of 60 psi and higher cure temperatures, there is evidence that the graphite fiber can touch the sensor surface and short the electrodes, a problem that will require a revised sensor package design. GRA

N85-23935# Michigan State Univ., East Lansing. Dept. of Metallurgy Mechanics and Materials Science.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF MECHANICALLY FASTENED COMPOSITES Final Technical Report, Sep. 1982 - Sep. 1983
G. Cloud, D. Sikarskie, E. Mahajerin, and P. Herrera Warren, Mich. Army Tank-Automotive Command Jul. 1984 82 p
(Contract DAAE07-82-K-4002)
(AD-A150961; TACOM-TR-13004) Avail: NTIS HC A05/MF A01 CSCL 13/5

The mechanics of fasteners in composites were studied in a combined experimental-theoretical research program. The objectives were to gain fundamental insight into the stress-strain field near pin-type fasteners and to provide guidance to designers responsible for the selection and sizing of fasteners. The primary experimental method utilizes Moire interference with optical Fourier processing of grid photoplates. A new technique using optical interference to generate gratings in three directions was developed to gain a factor of 10 in sensitivity. The constitutive properties of the material studied were measured. For the analytical work, a boundary element method (BEM) was developed, a compact and efficient computer code written, and the method compared with the finite-element method. For the problems investigated, the BEM is more efficient. The material used was fiber glass-epoxy laminate with woven fibers. The analytical and experimental forces were brought to bear on the problem of a loaded pin snugly fit in a hole. Results from the two approaches agreed well for the specific composite. Author (GRA)

N85-23936# Naval Research Lab., Washington, D. C.
THE EFFECT OF NOTCH ACUITY ON THE FRACTURE TOUGHNESS OF SILICON CARBIDE/ALUMINUM METAL MATRIX COMPOSITES Progress Report, Nov. 1983 - Jul. 1984
C. R. Crowe, R. A. Gray, and D. F. Hasson 27 Feb. 1985 13 p
(RR0-2204)
(AD-A150970; AD-E850774; NRL-MR-5417) Avail: NTIS HC A02/MF A01 CSCL 11/6

Discontinuous silicon carbide/aluminum alloy (SiC/A) metal matrix composites (MMC's) have exhibited improved physical and mechanical properties as compared to the properties of the wrought matrix alloy. These improved properties include high specific modulus, high creep strength, high fatigue resistance, low thermal expansion, and good thermal stability. The SiC/Al composites can be worked using standard metallurgical processing and hence they are inexpensive to produce compared to other MMC systems. The tensile ductility and fracture properties of the composite reported to date, however, are less than those of the wrought alloy. The tensile ductility has been improved by control of process parameters, but relatively little improvement in fracture toughness or notch sensitivity has been achieved. Although the composite materials show limited gross ductility, their fracture behavior exhibits many of the characteristics of ductile fracture. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-23937*# National Aeronautics and Space Administration, Washington, D. C.

AMMONIA FORMATION CAUSED BY THE PRESENCE OF WATER IN THE WET GRINDING OF SILICON NITRIDE POWDER

Yoshinori Kanno, Kazuo Suzuki, and Yoshitaka Kuwahara Dec. 1984 6 p refs Transl. into ENGLISH from Yogyo Kyokaishi (Japan), v. 91, no. 8, 1983 p 386-388 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Govt. Ind. Res. Inst.

(Contract NASw-4004)

(NASA-TM-77746; NAS 1.15:77746) Avail: NTIS HC A02/MF A01 CSCL 07D

Si3 N4 powder (amorphous, alpha-, and beta-Si3 N4) was mixed with MeOH containing 8.87 mol. % H2O and ground. The NH3 generation rapidly increased after a grinding time of 100 hours. Silicon nitride sintered material was chosen as one of the high temperature, high strength structural materials and studies of the control of the raw material powder, preparation of the sintered body (finding the right assistant, hot press, high pressure sintering, fracture toughness and oxidation at high temperature were performed. Author

N85-23938*# National Aeronautics and Space Administration, Washington, D. C.

SUBSTITUENT EFFECTS ON THE ELECTRICAL CONDUCTIVITIES OF THE PHENAZINE DERIVATIVES

Akira Sugimoto, Shizuo Furuyama, Hiroo Inoue, and Eiji Imoto Dec. 1984 11 p refs Transl. into ENGLISH from Nippon Kagaku Kaishi (Japan), no. 7, 1974 p 1289-1293 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-4004)

(NASA-TM-77792; NAS 1.15:77792) Avail: NTIS HC A02/MF A01 CSCL 07D

The and/or photoconductivities of 16 substituted phenazines having methoxy, hydroxy, chloro, nitro, amino or t-butyl group at 1-, 2-, 1, 6- or 2,7- positions of the phenazine ring measured by using the surface type cells. The energy gaps of the dark conductivities in the range 2.0 to 2.3 were independent of the kinds and the positions of the substituent groups, although the photo-absorption wavelength of the evaporated films changed with them, No correlation between photoconductivity and fluorescence was observed. The photocurrent was affected by the position of the substituents; namely, the photocurrents of the 1,6-di-substituted phenazines. When the substituent at 1,6-positions was hydroxy or amino group, however, the photocurrents decreased. The photocurrents decreased drastically in the presence of oxygen. Author

N85-23939*# Ergenics, Inc., Wyckoff, N.J.

CAPTURE OF LIQUID HYDROGEN BOILOFF WITH METAL HYDRIDE ABSORBERS Final Report

M. J. Rosso and P. M. Golben Apr. 1984 90 p refs

(Contract NAS10-10625)

(NASA-CR-175677; NAS 1.26:175677) Avail: NTIS HC A05/MF A01 CSCL 07D

A procedure which uses metal hydrides to capture some of this low pressure (,1 psig) hydrogen for subsequent reliquefaction is described. Of the five normally occurring sources of boil-off vapor the stream associated with the off-loading of liquid tankers during dewar refill was identified as the most cost effective and readily recoverable. The design, fabrication and testing of a proof-of-concept capture device, operating at a rate that is commensurate with the evolution of vapor by the target stream, is described. Liberation of the captured hydrogen gas at pressure .15 psig at normal temperatures (typical liquefier compressor suction pressure) are also demonstrated. A payback time of less than three years is projected. Author

N85-23940*# National Aeronautics and Space Administration, Washington, D. C.

A STUDY OF LIQUID-VAPOR EQUILIBRIA OF THE BROMINE-HYDROBROMIC ACID-WATER SYSTEM

P. Lessart and R Benizri Dec. 1984 19 p refs Transl. into ENGLISH of Conf. Paper from the Commission of the European Communities, Luxembourg, p 71-90 Presented at the 1st Seminar on Hydrogen as an Energy Vector: Its Production, Use and Transporation, Brussels, 3-4 Oct. 1978 Original language doc. was announced in IAA as A80-15978 Transl. by Scientific Translation Services, Santa Barbara, Calif. Original doc. was prep. by Commissariat a l'Energie Atomique, Saclay, France

(Contract NASw-4004)

(NASA-TM-77748; NAS 1.15:77748) Avail: NTIS HC A02/MF A01 CSCL 07D

A bibliographical study of the liquid-vapor equilibria of the ternary system H2O-HBr-Br2 system is presented. The diagram of the binary system H2O-Br2 is known at atmospheric pressure, and data are available on the solubility of bromine in water and on the demixing zone of this binary system. Some results of bromine solubility measurements in aqueous hydrobromic acid exist, while the miscibility region of the pseudoternary system H2O-47 percent HBr-Br2 is known as 20 C. However, the liquid-vapor equilibrium of the binary system H2O-Br2 was only studied partially, and the ternary system H2O-HBr-Br2 was not investigated. A glass ebullioscope was used to study these equilibria in the concentration range of interest for evaluation of the Mark 13 thermochemical cycle (bromine-sulphur). A.T. (IAA)

N85-23941*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATIONS OF HIGH PRESSURE DIFFERENTIAL SCANNING CALORIMETRY TO AVIATION FUEL THERMAL STABILITY RESEARCH Final Report

Maurice C. Neveu (State Univ. of New York, Fredonia) and Dennis P. Stocker Apr. 1985 25 p refs

(NASA-TM-87002; E-2547; NAS 1.15:87002) Avail: NTIS HC A02/MF A01 CSCL 21D

High pressure differential scanning calorimetry (DSC) was studied as an alternate method for performing high temperature fuel thermal stability research. The DSC was used to measure the heat of reaction versus temperature of a fuel sample heated at a programmed rate in an oxygen pressurized cell. Pure hydrocarbons and model fuels were studied using typical DSC operating conditions of 600 psig of oxygen and a temperature range from ambient to 500 C. The DSC oxidation onset temperature was determined and was used to rate the fuels on thermal stability. Kinetic rate constants were determined for the global initial oxidation reaction. Fuel deposit formation is measured, and the high temperature volatility of some tetralin deposits is studied by

thermogravimetric analysis. Gas chromatography and mass spectrometry are used to study the chemical composition of some DSC stressed fuels. E.A.K.

N85-23942# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
INFLUENCE OF UNCOMPENSATED SOLUTION RESISTANCE UPON THE EVALUATION OF RATE CONSTANTS FOR RAPID ELECTROCHEMICAL REACTIONS
D. Milner and M. J. Weaver Jan. 1985 10 p
(Contract N00014-79-C-0670)
(AD-A150657; TR-43) Avail: NTIS HC A02/MF A01 CSCL 07/4

We have recently outlined an experimental method whereby the reliability of observed standard rate constants for outer-sphere electrochemical reactions, evaluated using a given technique and a set of experimental conditions can be tested in a direct manner. This entails monitoring the response of the apparent observed values of standard rate constants, apparent observed rate constants, to systemic alterations of the strongly double-layer structure caused by the addition of small concentrations of specifically adsorbing anions. This procedure enables standard rate constants for the test reaction to readily be tuned over to a wide range. These apparent rate variations, are compared with those observed under the same conditions for a structurally similar, yet irreversible, calibration reaction having rate constants in the range ca. .0001 to .01 cm/sec, where they can be evaluated reliability using straightforward dc. methods. This comparison enables the extent of departure of apparent observed rate constants from the corresponding true rate constants, for values that approach the suspected measurement limit to be obtained, provided that the data set also includes sufficiently small values of apparent observed rate constants. GRA

N85-23943# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
NONCONTINUUM SOLVENT EFFECTS UPON THE INTRINSIC FREE-ENERGY BARRIER FOR ELECTRON-TRANSFER REACTIONS
J. T. Hupp and M. J. Weaver Jan. 1985 34 p
(Contract N00014-79-C-0670)
(AD-A150662; TR-39) Avail: NTIS HC A03/MF A01 CSCL 07/4

A phenomenological electrochemical approach is outlined by which noncontinuum contributions to the outer-shell intrinsic barrier to electron transfer, resulting from specific reactant-solvent interactions can be estimated from the measured dependence of the formal potential upon the molecular and structural properties of the solvent. A simplified derivation, based on electrochemical half reactions, of the conventional dielectric continuum expression is given in order to clarify the physical origins of the outer-shell intrinsic barrier and to identify likely additional noncontinuum components. Numerical calculations for ammine and other redox couples involving specific ligand-solvent interactions indicate that the noncontinuum contributions to the outer-shell intrinsic barrier to electron transfer for both homogeneous and electrochemical exchange reactions can be surprisingly small (typically less than or = 1-2 kcal/mol) even when the thermodynamics of ion solvation are in severe disagreement with the dielectric continuum (Born) predictions. An additional noncontinuum component associated with vibrational distortions of outer-shell solvent may be significant for multicharged aquo complexes and other reactants engaging in strong ligand-solvent hydrogen bonding. GRA

N85-23944# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
LIGAND STRUCTURAL INFLUENCES UPON ELECTROCHEMICAL REACTIVITY: ORGANIC SUBSTITUENT EFFECTS UPON CARBOXYLATOPENTAAMMINECOBALT(3) REDUCTIONS AT MERCURY AND GOLD ELECTRODES
T. T. T. Li and M. J. Weaver Jan. 1985 35 p
(Contract N00014-79-C-0670)
(AD-A150685; TR-41) Avail: NTIS HC A03/MF A01 CSCL 07/4

The electroreduction kinetics of 33 carboxylatopentaamminecobalt(3) complexes containing a variety of aliphatic, aromatic, and heterocyclic substituents have been examined at mercury- and gold-aqueous interfaces and compared with the corresponding homogeneous reduction rates with Ru(NH3)6(2+) in order to examine the relationships between the substituent structure and electrochemical reactivity. Complexes having acyclic aliphatic groups yielded normal outersphere reactivities on the basis of their similar relative rate constants at a given electrode potential in comparison with the corresponding homogeneous rate ratios. However, electrochemical reactivities that are enhanced by ca 10 to 10,000 fold on this basis were observed for complexes with ring-containing substituents. Similar unimolecular rate constants were nonetheless observed for the electroreduction of several of these complexes when electrostatically adsorbed at chloride-coated silver. This indicates that the observed catalysis at mercury and gold surfaces arises from reactant adsorption, i.e., from increased precursor stability, presumably associated with hydrophobic or van der Waals ligand-surface interactions. GRA

N85-23945# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
FUNDAMENTAL STUDY OF THREE DIMENSIONAL TWO PHASE FLOW IN COMBUSTION SYSTEMS Final Report, 1 Oct. 1983 - 30 Sep. 1984
J. Swithenbank, S. A. Vasquez, and P. N. Wild 20 Nov. 1984 161 p Sponsored in part by European Office of Aerospace Research and Development
(Grant AF-AFOSR-0011-84)
(AD-A150739; AFOSR-85-0082TR) Avail: NTIS HC A08/MF A01 CSCL 21/2

Combustion systems involve the complex interaction between several fundamental phenomena. In this investigation, the basic science underlying the interactions between the two-phase flow, fluid dynamics, and chemical kinetics have been investigated. The studies have required the development of new diagnostic systems and significant progress has been made in the following areas: - The development of a technique for making accurate dropsize measurements in dense sprays. The application of this technique to an F101 air blast atomizer. The use of LDA for the precise characterization of swirl from the F101 swirler. The development of shear stress mathematical models for non-isotropic turbulence. The application of this model to the F101 swirler. The development of a mercury vapour pulse tracer for residence time distribution measurement in combustors. The development of a mathematical modelling technique whereby the residence time distribution can be computed. Closing of the gap between stirred reactor models and finite difference models of combustion systems. Proposal of a new fundamental approach to the problem of simultaneous mixing and reaction using a quantitative coalescene/dispersion eddy concept which has the potential to represent all the high order correlations of the interaction. GRA

N85-23946# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
EVALUATION OF UNIMOLECULAR RATE CONSTANTS FOR SOME OUTER-SPHERE ELECTROCHEMICAL REACTIONS
M. A. Tadayyoni and M. J. Weaver Jan. 1985 27 p
(Contract N00014-79-C-0670)
(AD-A150758; TR-40) Avail: NTIS HC A03/MF A01 CSCL 07/4

Unimolecular rate constants, K sub et (per sec -1), and transfer coefficients, alpha sub et, for the outer-sphere electroreduction of several Co(III) ammine and ethylenediamine complexes have been evaluated by electrostatically adsorbing the reactants at silver electrodes coated with chloride or bromide monolayers. Sufficiently strong diffuse-layer adsorption is thereby produced so to enable K sub et and alpha sub et to be determined by means of linear sweep voltammetry, employing sufficiently fast sweep rates (10-100V/sec) and dilute reactant concentrations (less than or = 50 micrometers) so that the bulk solution reactant contributes negligibly to the observed faradaic transients. Comparisons with corresponding rate constants and transfer coefficients for the solution reactants enables the influence of precursor-state stability upon the latter rate parameters to be assessed. GRA

N85-23947# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NON-STEADY COMBUSTION OF COMPOSITE SOLID PROPELLANTS Final Report, 1 Oct. 1980 - 31 Mar. 1984
N. S. Cohen and L. D. Strand May 1984 54 p
(Grant AF-AFOSR-ISSA-83-00052)
(AD-A150827; JPL-D-1602; AFOSR-85-0103TR) Avail: NTIS HC A04/MF A01 CSCL 19/1

Analytical models were developed for the linearized pressure-coupled and velocity-coupled combustion response functions of composite propellants. The theory is that compositional fluctuations occur in the course of composite propellant burning, that these fluctuations originate from the inherent heterogeneity of the propellant microstructure, and that they will contribute to the nonsteady combustion under oscillating pressure (and velocity) conditions. Properties of the response to compositional fluctuations were determined and compared with responses to pressure and velocity fluctuations in series of parametric studies. The response to compositional fluctuations was found to be relatively strong response. Each response tended to increase with increasing AP particle size and pressure, and with decreasing mean crossflow velocity. A series of experiments was carried out with three propellants to determine whether or not certain features of the microstructure could be measured and correlated with response function behavior. Additional tasks pertaining to nonlinear combustion response and high frequency combustion response were performed and are described in the text. A list of publication generated by or in the course of this program is presented. GRA

N85-23948# George Washington Univ., Washington, D.C. Dept. of Chemistry.
BONDING INFORMATION FROM AUGER SPECTROSCOPY
D. E. Ramaker Nov. 1984 26 p
(Contract N00014-80-K-0852; PP01308)
(AD-A150864; TR-14) Avail: NTIS HC A03/MF A01 CSCL 07/4

The use of Auger Spectroscopy to obtain bonding and electronic structure information is reviewed. The methods for extracting the Auger lineshape from the experimental spectrum are described; in particular the background substraction and loss deconvolution techniques are presented. A prescription is given for quantitatively interpreting the lineshape utilizing an empirically determines one-electron DOS and atomic Auger matrix elements. Final state hole-hole correlation or localization effects on the lineshape are emphasized. The carbon KVV lineshapes of graphite, diamond, and the carbides are examined. Localization effects in the lineshapes are correlated with ionic bonding character. GRA

N85-23949# George Washington Univ., Washington, D.C. Dept. of Chemistry.
CHEMICAL AND LOCALIZATION EFFECTS IN AUGER LINESHAPES OF TRANSITION METAL COMPOUNDS
P. E. Pehrsson and D. E. Ramaker Nov. 1984 5 p
(Contract N00014-80-K-0852; P01308)
(AD-A150865; TR-17) Avail: NTIS HC A02/MF A01 CSCL 07/4

The compounds MXn(X=C, N, O) display sequential changes in the C-KLL Auger spectra and these changes in the C-KLL Auger spectra and these changes correlate with the density -of-states (DOS), the relative proportions of ionic, covalent and metallic bonding, and screening and localization of the Auger holes. In this work we quantitatively interpreted the C-KLL lineshape of TiC, using previously described techniques. We further investigated the X-KII lineshape changes as the number of 3d electrons increases across the rows of the transition metals, and as the nonmetalloid atom changes from C to N to 0. The effects of sample nonstoichiometry were also examined. GRA

N85-23950# Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.
PHYSICAL CHEMISTRY OF EXOTHERMIC GAS-AEROSOL CALORIMETRY Contractor Report, Jan. 1983 - Jan. 1984
R. A. Mackay Jan. 1985 45 p
(Contract DAAK11-80-C-0051; DA Proj. 1L1-62622-A-552)
(AD-A150872; CRDC-CR-84120) Avail: NTIS HC A03/MF A01 CSCL 07/4

Infrared emission has been observed from exothermic gas-aerosol reactions. The principal system examined was liquid chlorosulfonic and aerosol reacting with ammonia and water vapor. The aerosols employed in this study have been polydisperse with mass medium diameters of a few microns. In order to develop methods to investigate the kinetics of rapid gas-aerosol reactions, a generator has been designed which produces monodisperse aerosol in the 0.5 - 1.5 micrometer diameter range. This generator can be used with corrosive and reactive liquids. A flow reaction and sizing system has been designed and constructed. GRA

N85-23951# University of Southern California, Los Angeles. Dept. of Chemistry.
MULTIPLE PRODUCT CHANNELS IN THE COLLISION FREE UV PHOTODISSOCIATION OF 2-NITROPROPANE Annual Report, 1 Apr. 1983 - 31 Mar. 1984
C. Wittig 1 Apr. 1984 23 p
(Contract N00014-80-C-0539)
(AD-A150886) Avail: NTIS HC A02/MF A01 CSCL 07/5

In the experiments reported herein, we present our initial results concerning the different photodissociation pathways which accompany the UV photolysis (222, 249, and 308 nm) of 2-nitropropane (2NP), under collision-free conditions. Since there are no nitrogen atom lone pair electrons, excitation involves the promotion of an oxygen atom lone pair electron into an antibonding pi-group orbital. Even though the subsequent radiationless transition out of S sub 1 is rapid, the nuclear motions which commence upon absorption of a photon cause the nuclei to reconfigure, particularly in the vicinity of the NO2 group. The radical-like nature of the oxygen can facilitate the formation of a 5-membered ring, which can lead to products such as OH and HONO, and NO2 can also be liberated efficiently before the nuclear energies dissipate into the vibrational reservoir of the propyl radical. We find that all three of these products are produced at each of the photolysis wavelengths, and that OH is a nascent product in all instances. GRA

N85-23952# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical and Environmental Engineering.
COMBUSTION KINETICS OF METAL OXIDE AND HALIDE RADICALS Annual Report, 1 Dec. 1983 - 30 Nov. 1984
A. Fontijn 4 Jan. 1985 15 p
(Grant AF-AFOSR-0073-82)
(AD-A150924; AFOSR-85-0076TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

Experimental measurements on isolated elementary metallic radical oxidation reactions over wide temperature ranges are described. Reactions of importance to advanced propulsion systems are studied. The temperature dependence of the rate coefficients of many of the reactions deviate strongly from the commonly used Arrhenius equation. Therefore, extrapolations, based on this equation, from narrow to wide intervals can not be used. Results for the reaction AlO+CO2 yield AlCO2+CO from 450-1300K are given. The rate coefficient expression equals 2 x 10 to the -14th power exp (530/T) 3cc molecule s. The reaction thus has a slight negative temperature dependence. It is concluded that the O-(AlO) bond formed has an energy equal to or exceeding 530 kJ/mol, much larger than reported in the literature. A possible reason for this disagreement is discussed. GRA

N85-23953# Belgian Center for Corrosion Study, Brussels.
DIAGRAMS OF CHEMICAL AND ELECTROCHEMICAL EQUILIBRIA IN THE PRESENCE OF OXYGEN AND SULPHUR Final Report
M. Pourbaix Nov. 1984 93 p
(Grant AF-AFOSR-0141-84)
(AD-A150929; EOARD-TR-85-04) Avail: NTIS HC A05/MF A01 CSCL 07/4

On the basis of published thermodynamic data, diagrams representing the influence of temperature and pressure on the equilibrium conditions of 20 reactions were established. These

diagrams are applied to the study of the influence of temperature and pressure on the stability of troilite FeS and pyrite FeS2, and on the stability and composition of high temperature hexagonal pyrrhotite gamma FeS 1X and of molten ferrous sulphide. Other diagrams were constructed and applied to the study of the influence of temperature and pressure on the stability and decomposition of FeSO4 and Fe2(SO4)3, on the ferric oxide as a catalyst for the oxidation of (SO2) to (SO3), and on the high temperature corrosion of iron in gaseous atmospheres containing oxygen and sulphur derivatives. GRA

N85-23954# George Washington Univ., Washington, D.C. Dept. of Chemistry.
CHARGE TRANSFER, POLARIZATION AND RELAXATION EFFECTS IN THE AUGER LINESHAPES OF Si
D. E. Ramaker, F. L. Hutson, N. H. Turner, and W. N. Mei Nov. 1984 33 p
(Contract N00014-80-K-0852; P01-308)
(AD-A150938; TR-15) Avail: NTIS HC A03/MF A01 CSCL 07/4

The Auger lineshapes of Si are quantitatively interpreted noting particularly the core hole screening effects as exhibited through charge transfer, polarization, and atomic relaxation. The KL sub 1v, KL sub 23 V, and L sub 1 L sub 23V lineshapes reflect a core hole screened density of states, DOS consistent with the core hole in the final state of these processes. A DOS appropriate for the screened core hole is obtained by distorting the theoretical DOS for the ground state utilizing the Green's function for a tight binding Hamiltonian and a central cell potential. Comparison of the L sub 23 VV and KVV lineshapes reveal large differences. These difference are discussed in the context of surface effects, intrinsic and extrinsic plasmon losses, and final state shakeoff. The L sub 23 VV and KVV lineshapes also suggest some distortion effects due to final state hole correlation. The KL sub 23 L sub 23 lineshape is interpreted in the context of similar lineshapes for Na, Mg, Al and P; all show plasmon losses, and except for P, initial state shakeoff contributions. GRA

N85-23955# George Washington Univ., Washington, D.C. Dept. of Chemistry.
ELECTRON STIMULATED DESORPTION AND THE ROLE OF SECONDARY ELECTRONS
F. L. Hutson, D. E. Ramaker, V. M. Bermudez, and M. A. Hoffbauer Nov. 1984 13 p
(Contract N00014-80-K-0852; PP0-1308)
(AD-A150974; TR-16) Avail: NTIS HC A02/MF A01 CSCL 07/4

Electron stimulated desorption (ESD) yields of ions and neutrals from surfaces are expected to contain large contributions due to backscattered electrons from the bulk. A procedure for deconvoluting these effects from experimental yield data has been developed which includes contributions from both true secondaries and backscattered primaries. The procedure allows for changes in the backscattered yield with primary energy which is particularly necessary at low primary energies (10-40 eV) where most ESD thresholds occur. This method is applied to recently published excited OH neutral (OH) yield from TiO2. Although this deconvolution procedure reveals significant contributions from backscattered electrons, more importantly it also indicates that a significant yield arises from a direct non resonant excitation mechanism and not from secondary electrons. The resonant portion of the OH yield curve from TiO2 is found to be similar to published O(-) ESD data from O/W and O/Mo. GRA

N85-23956# Colorado Univ., Boulder.
INTERNATIONAL CONFERENCE ON COORDINATION CHEMISTRY (23RD) HELD AT BOULDER, COLORADO ON 29 JULY - 3 AUGUST, 1984 Final Report, 1 May 1984 - 30 Apr. 1985
R. Sievers 26 Sep. 1984 6 p Conf. held in Boulder, Colo., 29 Jul. - 3 Aug. 1984
(Grant AF-AFOSR-0094-84)
(AD-A150980; AFOSR-85-0148TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The International Conference on Coordination Chemistry was held in the United States. It took place at the University of Colorado, Boulder, on July 29 through August 3, 1984. The number of active participants was 784 and the number of accompanying guests was 145. Thirty-seven countries were represented. Sixty-five percent of the attendees were from the United States, and the remaining thirty-five percent were from other countries. Those areas where the largest interest and most papers were presented are in the areas as follows: (1) Energetics and Dynamics-Kinetics and Mechanisms; (2) Energetics and Dynamics-Electrochemistry/Thermodynamics; (3) Bioinorganic-Metalloenzymes; (4) Synthesis-Special Ligands; (5) Techniques and Applications-Electronic Structure. GRA

N85-23957# Monsanto Co., Dayton, Ohio. Dayton Lab.
COMPOSITIONAL AND STRUCTURAL ANALYSIS OF AIR FORCE MATERIALS Final Report, 15 May 1982 - 15 Sep. 1984
A. D. Snyder and J. H. Workman Wright-Patterson AFB, Ohio Air Force Wright Aeronautical Labs. 11 Jan. 1985 17 p
(Contract F33615-82-C-5028)
(AD-A150992; MC-DA-1171; AFWAL-TR-84-4160) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work performed during the period 15 May 1982 - 15 September, 1984 in support of various Air Force programs is summarized. The work covers routine analyses, methods development, support programs, service functions, materials characterization and the application of various analytical chemical techniques. Analytical techniques included: Chemical Analysis, Materials Characterization, Microchemical Analysis, Mass Spectrometry, Molecular Spectrometry. GRA

N85-23958# School of Aerospace Medicine, Brooks AFB, Tex.
COMPARISON OF FLAME PHOTOMETER DATA WITH TOTAL PARTICLE VOLUME CALCULATED FROM LASER SPECTROMETER PARTICLE COUNT DATA Final Report, 1 Jan. - 30 Jun. 1984
A. R. Laird, D. G. Beland, and I. S. Goldberg Dec. 1984 13 p
(AF Proj. 2729)
(AD-A151008; USAFSAM-TR-84-50) Avail: NTIS HC A02/MF A01 CSCL 06/11

Respirator Quantitative Fit Test (RQFT) Flame Photometer data have been compared with total particle volume calculated from LAS-X laser spectrometer particle count data. Total volume data were calculated by the method developed by Goldberg and Laird (1). Results indicate that there is a linear relationship between flame photometer voltage and the logarithm of sodium chloride (NaCl) total particle volume over 3-4 decades in NaCl concentration. Results also indicate that flame photometer voltage is not strongly dependent on NaCl particle size. Total particle volume data can be used to calibrate the flame photometer over about 4 decades in NaCl concentrations. GRA

N85-23959# Vermont Univ., Burlington. Dept. of Chemistry.
MIXED VALENCE MATERIALS Final Report
W. E. Geiger, Jr. 1985 5 p
(Contract N00014-82-K-0289)
(AD-A151009) Avail: NTIS HC A02/MF A01 CSCL 07/2

Spectroscopic and Magnetic Studies of a Mixed-Valence Iron Fluoride, Fe2F57H2O were carried out. The Structure of a Mixed-Valence Iron was determined. Magnetic Exchange in a Chloride and Adeninium Bridged Linear Trimer of Copper (II)-Octachlorobis-(adeninium) tricopper (II) Tetrahydrate was effected. GRA

N85-23960# Texas A&M Univ., College Station. Dept. of Chemistry.
ION TRANSPORTING COMPOSITE MEMBRANES. 1: NAFION IMPREGNATED GORE-TEX
R. M. Penner and C. R. Martin 2 Jan. 1985 8 p
(Contract N00014-82-K-0612)
(AD-A151020; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Ion transporting membranes are required in a variety of

electrochemical processes and devices including chlorine-caustic production, batteries, fuel cell, electrolyzers, etc. Nafion, a perfluorosulfonate ionomer marketed by Du Pont has proved useful for a number of these applications. Nafion has a number of attractive features including good chemical and mechanical stability and high perselectivity. In addition, however, it has two potentially significant disadvantages - it is a cation transporting membrane (i.e., there is no anion transporting equivalent) and it is rather expensive. These difficulties have prompted efforts to develop anion and cation transporting materials which have Nafion's desirable chemical and mechanical features but which can be produced more cheaply. It occurred to us that a cheaper and more versatile membrane material might be prepared by doping an inexpensive, nonconductive material with a small amount of an ion transporting polymer. In an effort to demonstrate the feasibility of this approach, we have impregnated commercially available porous polytetrafluoroethylene membranes (Gore-Tex) with small quantities of Nafion, to make cation transporting composites. Electrode surfaces were covered with these composite membranes electrochemical techniques were used to study the membranes transport properties. We have shown that the Nafion-doped Gore-Tex does, indeed, transport cations and that the rate of transport can be much higher than the transport rate in a pure Nafion membrane. GRA

N85-23961# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Science.

CHARACTERIZATION OF SUPPORTED METAL CATALYSTS BY IMAGING, MICRODIFFRACTION AND MICROANALYSIS TECHNIQUES

A. G. Dhere, P. J. Reucroft, R. J. DeAngelis, and J. Bentley 1984 10 p refs Presented at Microbeam Analysis Soc. Anal. Electron Microscopy Meeting, Bethlehem, Pa., 16 Jul. 1984 Prepared in cooperation with Oak Ridge National Lab., Tenn.

(Contract DE-AC05-84OR-21400)

(DE85-005567; CONF-840767-16) Avail: NTIS HC A02/MF A01

The techniques in analytical electronmicroscopy which can be used to study the structural and morphological features of the catalysts are highlighted. The use of such techniques is increasing rapidly because of the great potential for characterizing the size, morphology, and structural defects in the metallic particles and also because of the contributions microanalysis can make to understanding interactions between the metal particles and the support materials. Certain limitations of these techniques are discussed in reference to analysis of catalytic systems. The catalyst samples discussed are 11.9% Ni/SiO2, 14.2% Ni/MgSiO3, phosphorous reduced colloidal gold, sodium-citrate-reduced colloidal gold, and C-150-1-01 catalyst containing approximately 52% nickel on a silica support. DOE

N85-23962# New Orleans Univ., La. Dept. of Chemistry.

COLLABORATIVE SHOCK TUBE STUDIES OF BENZENE PYROLYSIS

R. D. Kern, C. H. Wu, G. B. Skinner, V. S. Rao, J. H. Kiefer, J. A. Towers, and L. J. Mizerka 1984 28 p refs Presented at 20th Intern. Symp. on Comust., Ann Arbor, Mich., 12 Aug. 1984 Prepared in cooperation with Wright State Univ., Dayton, Ohio, Illinois Univ., Chicago

(Contract DE-AS05-79ER-10505)

(DE85-006347; CONF-840801-15) Avail: NTIS HC A03/MF A01

Three independent shock tube techniques, time of flight mass spectrometry (TOF), atomic resonance absorption spectroscopy (ARAS), and laser schlieren density gradient measurements (LS), were employed to investigate the thermal decomposition of benzene (C6H6 or C6D6) in dilute inert gas mixtures over a wide range of reactant concentration (3 to 21,000 ppM), total pressure (0.2 to 3 atm) and temperature (1515 to 2500 K). The latter two methods were used to derive rate constants for the dissociation of C6H6 (YIELDS) Q6H5 + H and C6H5 (YIELDS) C2H2 + C4H3 and the overall rate of benzene decomposition that occurred primarily via a direct ring rupture process C6H6 (YIELDS) C2H2 + C4H4. The ring rupture step was shown to be in the fall off region. Rate constants subject to fall off effects were adjusted for particular reaction conditions and used in a mechanism which included steps for acetylene pyrolysis to model the major species, C6H6, C2H2, C4H2, recorded by the TOP experiments, D atom production by ARAS, and density gradient profiles by LS. DOE

N85-23963# Sandia Labs., Albuquerque, N. Mex.

THE EFFECT OF WATER CHEMISTRY ON THE RATES OF HYDROGEN GENERATION FOR GALVANIZED STEEL CORROSION AT POST-LOCA CONDITIONS

V. M. Loyola and J. E. Womelsduff Dec. 1984 38 p refs

(Contract NRC-FINN-A-1225)

(NUREG-CR-3361; SAND-83-1326) Avail: NTIS HC A03/MF A01

The rates of hydrogen generation are measured for the corrosion of galvanized steel in three different light water cooled reactor (LWR) water chemistries. The results were obtained over a temperature range of 100 to 175 C and indicate that in a boiling water reactor (BWR) water chemistry, the reaction is faster than in those of two pressurized water reactors (PWR's). A mechanism is proposed which would explain the observed results without requiring that the chemical additives come in direct contact with the coordible unoxidized metal. Such a mechanism is required because electron microprobe analysis suggests that no chemical additives have diffused into the protective ZnO layer which forms on the unoxidized metal. Arrhenius parameters are calculated for the three chemistries, but some questions are raised about whether those parameters are associated with a diffusion process or with the actual hydrogen producing reaction. Author

N85-23964# California Univ., Livermore. Lawrence Livermore Lab.

MODEL FOR HIGH RATE GAS FLOWS IN DEFORMABLE AND REACTIVE POROUS BEDS

A. M. Weston 8 Jan. 1985 80 p refs

(Contract W-7405-eng-48)

(DE85-006140; UCID-20310) Avail: NTIS HC A05/MF A01

The development of a one dimensional planar Lagrange hydrodynamic computer model which describes the processes preceding detonation is presented. The model treats gas flow, deflagration, and compaction in a porous bed of reactive material. The early part of deflagration to detonation experiment with porous HMX is simulated. Sensitivity of the simulation calculation to ignition and burn rate parameters is illustrated and discussed. The effects of changing the mean particle size of the porous material are investigated. Comparisons with an experiment of porous HMX are presented to illustrate details of the model and to point out important features of the observed phenomenon. A geometric finite element cell is devised that allows gas to flow through a compacting matrix. The experimental simulation considers the DDT process from initial squib burn through the onset of general matrix deflagration (convective burning), to the development of a fully dense compaction wave. It is shown that deflagration and gas permeation lags compaction at the time of transition. DOE

N85-23965# Renault Vehicles Industriels (France). Direction Etudes et Recherches.

DIESEL COMBUSTION: ADVANCES IN ANALYSIS AND SIMULATION

Philippe Flechon 1984 9 p refs In FRENCH; ENGLISH summary

Avail: NTIS HC A02/MF A01

Diesel combustion simulation phenomenological models which take into account heterogenity of temperatures and concentrations are described. A program for combustion analyses by going through instant measurements recorded from the running engine is discussed. A program to stimulate fuel spray penetration, based on the assumption of air entrainment, which allows visualization of the spray path within the chamber and the entrained air flow and the species within the flow, is presented. The models were calibrated in tests on single and multicylinder engines. The models predict the performance, heat transfer and gaseous emission formation (hydrocarbons, nitrogen oxides and smoke).

Author (ESA)

N85-23966# Institut Franco-Allemand de Recherches, St. Louis (France).
THE DETONATION OF AEROSOLS AND VAPORS OF COMBUSTIBLE SUBSTANCES UNDER CONTROLLED CONDITIONS. PART 1: CONSTRUCTION OF A TEST INSTALLATION Final Report [DIE DETONATION VON BRENNSTOFFAEROSOLEN UND DAEMPFEN UNTER KONTROLLIERTEN BEDINGUNGEN. TEIL 1: AUFBAU EINER VERSUCHSANLAGE]
G. Smeets, E. Burde, G Parmentier, and G. Mathieu 11 May 1983 52 p refs In GERMAN Original contains color illustrations
(Contracts BMVg-T/R-760/B-006/B-3706; BMVg-T/R-760/C-0004/C-1704)
(ISL-R-109/83-Pt-1) Avail: NTIS HC A04/MF A0

A vertical shock tube of 0.5 m diameter and 4 m length in which a homogeneous aerosol can be produced by pulverization through a system of spray nozzles was developed. The concentrations of liquid and gaseous combustibles, and the droplet size distribution are experimentally determined. The ignition of the mixture is obtained by a strong shock wave produced by the detonation of an explosive charge placed at the upper side of the tube. Wall pressure gages give the evolution of the detonation in the tube. Optical probes allow a detailed analysis of the phenomena occurring in the reaction zone. Experiments were conducted during construction to check the operation of the shock tube and to optimize the spraying and measuring systems. Author (ESA)

N85-24706# Joint Publications Research Service, Arlington, Va.
EXTRACTION OF IONS FROM SOLUTIONS AT ATMOSPHERIC PRESSURE, MASS SPECTROMETRIC ANALYSIS OF BIOORGANIC SUBSTANCES Abstract Only
M. L. Aleksandrov, L. N. Gall, N. V. Krasnov, V. I. Nikolayev, V. A. Pavlenko, and V. A. Shkurov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 152 Transl. into ENGLISH from Dokl. Akad. Nauk SSR (Moscow), v. 277, no. 2, Jul. 1984 p 379-383 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-23967# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
STUDIES OF THE INITIATION OF PITTING CORROSION ON STAINLESS STEELS
D. E. Williams, C.W. Westcott, and M. Fleischmann Jun. 1984 38 p refs
(AERE-M-3400) Avail: Issuing Activity

A stochastic approach was applied to the study of the initiation of pitting corrosion on a number of stainless steels of different compositions in dilute NaCl. Peak counting, passage time, spectral density, ensemble statistics and slope distribution analyses were applied to recover the parameters of a general stochastic model and judge their dependence upon the experimental variables. The results support a simple local acidification model for the initiation of pitting corrosion, controlled by fluctuations in the thickness of the solution boundary layer. Author

N85-23968 Pennsylvania State Univ., University Park.
HYDROGEN ON IMPURITY-COVERED IRON SURFACES Ph.D. Thesis
Andrew Kelsey Birchenall 1984 212 p
Avail: Univ. Microfilms Order No. DA8429058

Hydrogen adsorption was studied on Fe(100) and Fe(100)-c(2 x 2)X with X being Si, C, S, and Sn-by means of AES, LEED, TDS, and Kelvin probe work function measurements. Fe(111)-p(1 x 1)Si, Fe(110)-c(7 x 1)Si, and Ni(100) were also investigated. On Fe(100), the presence of these impurities reduced the sticking probability, the desorption energy, the preexponential factor for desorption, and the saturation coverages. Different TDS features were observed if atomic hydrogen was presented to the surface. For C- and Si-covered surfaces, this behavior was attributed to formation of surface complexes. On S-and Sn-covered surfaces, atomic hydrogen adsorbed more readily than molecular hydrogen, but no complexes were formed. Dissert. Abstr.

N85-23969 Columbia Univ., New York.
THE CYCLIC STRESS-STRAIN BEHAVIOR OF NICKEL-BASE SUPERALLOY POLY- AND SINGLE CRYSTALS Ph.D. Thesis
Leslie Gene Fritzemeier 1984 67 p
Avail: Univ. Microfilms Order No. DA8427392

The cyclic stress-strain behavior of Nimonic 115a polycrystalline superalloy and Mar-M200, a monocrystalline alloy were investigated at ambient temperature and at 843 C. At ambient temperature both superalloys exhibit rapid hardening with cycling to a saturation level which remains nearly constant until macrocrack propagation begins. The cyclic stress-strain curves indicate the existence of low strain amplitude rapid hardening to a low slope plateau region. At elevated temperature the cyclic stress-strain curves become straight lines with no evidence of low strain amplitude stress drop. Differences between the polycrystal and single crystal were observed in the hysteresis loops and are discussed. The resisting stress (hysteretic yield) for Nimonic 115 shows a high initial value at low strain amplitudes dropping off as strain amplitude increases at both ambient and elevated temperature. The Mar-M200 resisting stress on the other hand was nearly constant at ambient temperature but exhibits a low initial value rising to an apparent saturation value. These differences point to differences in the details of the deformation mechanisms between the two alloys which were investigated by transmission electron microscopy. Dissert. Abstr.

N85-23970# Battelle Columbus Labs., Ohio.
AN OVERVIEW OF THE MIL-HDBK-5 PROGRAM Final Report, 9 Jun. 1980 - 2 Jul. 1984
P. E. Ruff Wright-Patterson AFB, Ohio AFWAL Sep. 1984 55 p
(Contract F33615-80-C-5037)
(AD-A147788; AFWAL-TR-84-1423) Avail: NTIS HC A04/MF A01 CSCL 05/2

An overview of the MIL-HDBK-5 program is presented. The intent of the overview is to provide information which will be helpful to those who are not familiar with the MIL-HDBK-5 program. In addition, the history of the MIL-HDBK-5 Handbook and its predecessor, ANC-5 Bulletin, has been chronicled for the first time. MIL-HDBK-5, Metallic Materials and Elements for Aerospace Structures , contains standardized mechanical property design values and other related design information for metallic materials, fasteners and joints, as well as other structural elements used in aircraft, missiles, and space vehicles. The mechanical property design allowables are presented on a statistical or specification basis. The products included in the document are standardized with regard to composition and processing methods and are described by industry or government specifications. In addition, the Handbook contains some of the more commonly used methods and formulas by which the strength of various structural elements are calculated. The last chapter of the document contains guidelines for the analysis and presentation of data for MIL-HDBK-5. Department of Defense agencies, Federal Aviation Administration (FAA) and National Aeronautics and Space Administration require the use of data in this Handbook in the design of aerospace vehicles which are purchased or controlled by them. GRA

N85-23971# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
INTRAMOLECULAR ELECTRON TRANSFER AT METAL SURFACES. PART 5: PENDANT SUBSTITUENT EFFECTS UPON THIOCARBOXYLATE-BRIDGED COBALT (3) REDUCTION KINETICS AT MERCURY AND GOLD ELECTRODES
T. T. T. Li and M. J. Weaver Jan. 1985 17 p
(Contract N00014-79-C-0670)
(AD-A150647; TR-42) Avail: NTIS HC A02/MF A01 CSCL 07/4

Unimolecular rate constants are reported for the reduction of pentaamminecobalt (III) anchored to mercury or gold electrodes via thiocarboxylate bridging ligands having the general form RSCH2COO (-). Since the carboxylate is bound to Co(III) and sulfur provides the surface binding group, the substituent R (where is various alkyl, carboxylate, ketone, or aromatic groups) will be pendant to the thiocarboxylate bridge linking the surface and cobalt reacting centers. Aleration of the pendant group R yields only small (ca. up to 4 fold) variations in unimolecular rate constants at a given electrode potential, although slightly larger variations occur in the stability of the precursor (absorbed reactant) state at mercury electrodes that are apparently due to specific interactions between R and the metal surface. The insensitivity of unimolecular rate constants to the pendant group is compared and contrasted with the effects of varying the substituent that bridges the redox center to the metal surface. Comparisons are also made with the pendent group effects for related redox processes in homogeneous solution. GRA

N85-23972# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.

ANNEALING EFFECTS IN FERROMAGNETIC AMORPHOUS ALLOYS Annual Report, 1 Nov. 1983 - 30 Oct. 1984

T. Egami and C. D. Graham, Jr. 30 Dec. 1984 10 p

(Contract N00014-80-C-0896)

(AD-A150648) Avail: NTIS HC A02/MF A01 CSCL 11/6

Annealing the ferromagnetic amorphous alloys produces structural relaxation which affects most of the physical properties. The manner with which the annealing affects the property, however, is not the same for all properties. In some cases the effect is irreversible below the glass transition temperature, while in other cases it is clearly reversible. Magnetic properties such as the field induced anistropy, creep-induced anisotropy, Curie temperature, and the permeability disaccommodation DA, are all reversible; they saturate to temperature dependent equilibrium values after some time during annealing, and if the annealing temperature is reversibly changed, they follow the change with some characteristic delay. We have shown that the four magnetic properties listed above and an elasticity measured by internal friction all share the basically same kinetics, and therefore the same microscopic mechanism. By computer simulation and X-ray diffraction, the microscopic mechanism of the reversible relaxation phenomena has been determined to be the local shear deformations which re-orient some of the atomic bombs. GRA

N85-23973# Naval Postgraduate School, Monterey, Calif.

AN INVESTIGATION OF ELEVATED TEMPERATURE FATIGUE CRACK INITIATION IN 2 AND 1/4 cR-1 MO LOW ALLOY STEEL M.S. Thesis

O. P. Keifer Jun. 1984 114 p

(AD-A150670) Avail: NTIS HC A06/MF A01 CSCL 11/6

Environmental effects in elevated temperature fatigue have been extensively studied and reported in the literature for 2 1/4 Cr-1 Mo steel. The results of cycles to failure (lumped initiation and propagation life) verses strain range have shown drastic reductions in fatigue life with a dwell period at compressive strains in each loading cycle. This thesis has separately examined the crack initiation and propagation stages for several specimens tested in air at 538 deg C without dwell and a single specimen with a five minute compressive dwell. With dwell, the crack initiation stage was severely reduced (by a factor greater than eleven) relative to testing without dwell. The results clearly indicate that oxide cracking is a precursor to crack initiation in the substrate. It is concluded that the fatigue life of this alloy must be estimated based on the crack propagation characteristics alone, since crack initiation can be expected very clearly (i.e., first few cycles) for any practical environment. GRA

N85-23974# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.

RESEARCH DIRECTED ADVANCED HIGH TEMPERATURE COATING SYSTEM BEYOND CURRENT STATE-OF-THE ART SYSTEMS Annual Report, 1 Jan. 1983 - 1 Jan. 1984

A. Ashary, G. H. Meier, and F. S. Pettit Dec. 1984 64 p Original contains color illustrations

(Grant AF-AFOSR-0089-80)

(AD-A150696; AFOSR-84-1278TR; AR-4) Avail: NTIS HC A04/MF A01 CSCL 11/6

Alloy systems have been investigated to determine the reaction product barriers that can be used to provide optimum resistance to high temperature oxidation. The reaction product barriers which can be used are Al(2)O(3), Cr(2)O(3), and SiO(2) with the use Cr(2)O(3), being restricted to below about 1000 C due to formation of volatile products. The oxidation of nickel-silicon alloys has been studied over the internal 900 to 1100 C. Compositions of 20 to 22.5 Si have been found to form protective, adherent scales of SiO(2). The oxidation resistance of these alloys appears to be comparable to the most oxidation resistant alumina-forming alloys. The cracking and spalling of Al(2)O(3) scales from alloys has been described by using acoustic emission analyses to conventional analytical techniques. It has been found that acoustic emission counts can be used to indicate the damage in alumina scales. A mechanism to describe the oxidation of oxygen active elements in alloys has been developed. The effects of yttrium and hafnium on the adherence of Al(2)O(3) to NicrAl and CoCrAl alloys has been compared. It is shown that the concentration of the oxygen active elements and the substrate composition are significant factors affecting oxide scale adherence. GRA

N85-23975# Naval Research Lab., Washington, D. C.

VARIABILITY IN CONSTANT-LOAD-AMPLITUDE FATIGUE CRACK GROWTH RATES IN MARINE ENVIRONMENTS Final Report

S. J. Gill and T. W. Crooker 25 Feb. 1985 32 p

(AD-A150786; NRL-MR-5524) Avail: NTIS HC A03/MF A01 CSCL 20/11

This report describes the results of an interlaboratory test program conducted to: (1) assess the variability in corrosion fatigue crack growth rate data obtained while using a proposed Navy standard test method, (2) identify and resolve problems with the proposed standard test method, and (3) provide verification of the proposed standard test method. Data were generated for an HY-80 steel by 15 laboratories using 10 mm (0.4 in.) thick 1-T wedge-opening-loaded specimens. The crack growth rate data was analyzed graphically and statistically and the interlaboratory variability was determined for each set of test conditions. Owing to the lack of replicate tests, it was not possible to assess intralaboratory variability. GRA

N85-23976# Naval Ship Research and Development Center, Bethesda, Md.

FRACTURE TOUGHNESS OF HY-130 STEEL WELD METALS

D. F. Hasson, C. A. Zanis, and D. R. Anderson Jun. 1984 16 p (F61541)

(AD-A150841; DTNSRDC-85/006) Avail: NTIS HC A02/MF A01 CSCL 11/6

The fracture toughness of the HY-130 steel weld metals and base metal was investigated using 1T compact tensile tests. The purpose of the study was to determine the effect of various welding procedures on the fracture toughness of as-deposited HY-130 steel weld metals compared to rolled base metal. Mechanical property, Charpy V-Notch energy, hardness and Jic computer interactive fracture toughness tests along with metallography and scanning electron microscopy were performed on gas metal arc (GMA) welds and gas tungsten arc (GTA) welds and also on rolled base metal. The HY-130 weld metals deposited by GMAW had lower crack initiation energy, Jic, values and tearing resistance, T, than the HY-130 steel base metal. This was attributed primarily to the higher oxygen content of the weld metals. The microstructure of the weld metals deposited by GMAW also had an effect on toughness. The HY-130 weld metals deposited by GMAW had superior fracture toughness compared to HY-130 base metal. Low heat input GTA welding conditions produced the highest fracture resistance. GRA

N85-23977# Auburn Univ., Ala. Dept. of Mechanical Engineering.
ORDERED CARBON METAL ALLOYS FOR EXTRATERRESTRIAL POWER SYSTEMS Interim Report, Apr. 1983 - Apr. 1984
B. A. Chin, N. H. Madsen, P. F. Gills, and S. C. Su 31 Jul. 1984 59 p
(Grant AF-AFOSR-0168-83)
(AD-A150881; AFOSR-85-0159TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

Theoretical methods of predicting ordering parameters of carbon metal based systems have been investigated. Preliminary methods of calculating the critical ordering temperature, and the maximum degree of order have been used to examine the characteristics of C-Zr, C-Mo, C-Ti and C-V systems. Based upon these calculations, the C-Ti system has been chosen as the most promising system in which the ultrahigh strength, ductility and temperature resistance, properties desired for space power generation materials, can be obtained. Fifteen titanium based alloys have been manufactured using an arc melting furnace to compare experimentally the effect of carbon content on the ordering parameters of carbon metal alloys with theoretical predictions. The alloys produced contained between 0 and 53 atom percent (0 to 22 weight percent) carbon. This first group of alloys did not contain transition and rare earth additions required for ductility improvement. This will allow an unperturbed comparison of ordering parameter theory with experimental results. Optical metallography and hardness tests have been completed on these alloys with interesting results for alloys containing between 35 and 53 atomic percent (12 to 22 weight percent) carbon. These all were found to contain significant amounts of phases not predicted from the phase diagrams. X-ray diffraction tests are being conducted to identify these constituents. An additional ten alloys have been manufactured using a new induction generator purchased under the contract. GRA

N85-23978# Imperial Coll. of Science and Technology, London (England).
THE ROLE OF HYDROGEN IN THE STRESS CORROSION FAILURE OF HIGH STRENGTH Al-Zn-Mg ALLOYS Annual Technical Report
M. L. Yuen and H. M. Flower 6 Oct. 1984 41 p
(Contract DAJA37-80-C-0372; DA Proj. IT1-61102-BH-57)
(AD-A150891) Avail: NTIS HC A03/MF A01 CSCL 11/6

Previous studies have been shown that high strength Al-Zn-Mg based alloys suffer environment assisted cracking. In the present work, room temperature constant strain rate (.0001/s .000001/s) and constant load tensile tests on Al 6% Zn 3% Mg and copper and chromium containing variants were extended to specimens pre-exposed to a steam environment at 120 C and to specimens tested in air, distilled water and salt solution. The embrittlement increased at lower strain rates, higher water content, and in the presence of chloride ions. In all cases, atomic hydrogen absorbed into the grain boundaries and the grain matrix causes grain boundary decohesion and cleavage. The ability to trap atomic hydrogen as H2 bubbles improves the embrittlement resistance. It is believed that the addition of copper to the alloy increases the hydrogen trapping efficiency, hence embrittlement resistance whereas in the chromium containing alloy, the oxide is probably modified to inhibit hydrogen entry. GRA

N85-23979# General Electric Co., Schenectady, N. Y.
SEM (SCANNING ELECTRON MICROSCOPY) STUDIES OF MAGNETIC DOMAINS IN AMORPHOUS METALS Final Report, Dec. 1981 - Nov. 1984
J. D. Livingston Jan. 1985 17 p
(Contract N00014-82-C-0060)
(AD-A150963; Rept-85-SRD-006) Avail: NTIS HC A02/MF A01 CSCL 11/6

Magnetic domain structures in amorphous ribbons were characterized by SEM and Bitter techniques. Studies included effects of anisotropy constant, applied currents, twisting, etc. Results were related to magnetic and magnetomechanical properties. Author (GRA)

N85-23980# Naval Research Lab., Washington, D. C.
LOCALIZED CORROSION CURRENTS FROM GRAPHITE/ALUMINUM AND WELDED SiC/Al METAL MATRIX COMPOSITES Memorandum Progress Report, Nov. 1983 - Jul. 1984
C. R. Crowe 28 Feb. 1985 19 p
(AD-A150988; NRL-MR-5415) Avail: NTIS HC A02/MF A01 CSCL 11/6

Scanning vibrating electrode techniques (SVET) have been used to study corrosion in Gr/Al and SiC/Al metal matrix composites. This new technique uses vibrating probes to measure localized ionic currents with spatial and current resolutions on the order of 15 to 20 micrometers and 5nA/sq cm, respectively. Thus, it is now possible to measure corrosion currents resulting from individual local cell activity on a scale closely related to many microstructural features of the composites. The relative severity of pits and crevices are associated with the corrosion process. The observations demonstrate that corrosion effects from metallurgical variations due to welding to SiC/Al can be detected and areas of accelerated corrosion activity delineated. The observations of the corroding Gr/Al specimen imply that the corrosion rate of the composite in the absence of flaws would depend upon the catalytic properties of the graphite in promoting or retarding the oxygen reduction reaction as well as the rate of diffusion of O2 to the surface. Both the exchange current density for the reaction and the Tafel constant would affect the oxygen reduction reaction rate. Thus, the corrosion rate in the absence of flaws might be improved by additions of positions to the fiber to retard the oxygen reduction reaction on graphite. The fact that an increase in the anodic current streaming from the flaws was detected indicates that the interface and crevice corrosion is important. GRA

N85-23981# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
SYNTHESIS AND PROPERTIES OF ELEVATED TEMPERATURE P/M ALUMINUM ALLOYS Annual Technical Report, 1 Oct. 1983 - 30 Sep. 1984
M. E. Fine and J. R. Weertman 30 Nov. 1984 97 p
(Grant AF-AFOSR-0005-82)
(AD-A151031; AFOSR-85-0139TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

The dispersed phases in the Al-8Fe, Al-10Fe-1.5Mo-1V, Al-8.8Fe-3.7Ce and Al-8.9Fe-6.9Ce RSP P/M alloys have been examined for composition and coarsening rate. Additionally, effects of prior heat treatment and deformation on particle coarsening have been studied. Energy dispersive spectroscopy on extracted particles from the Al-8Fe and Al-10Fe-1.5Mo-1V alloys in the as-received condition as well as after aging at 316 C indicated that the particles have compositions close to Al6Fe. In these two alloys, aging 240 hours at 425 C gives particles close to Al13Fe4 in composition. In Al-Fe-Ce alloys aged at 425 C, two kinds of particles are present with composition close to Al13Fe4 and Al10Fe2Ce. Some Al6Fe is seen in these alloys in the as-received condition and also after aging at 316 C. Overall coarsening rates of the dispersed phases indicate that at 375 and 425 C the Al-Fe-Mo-V alloy coarsens more slowly than the other three alloys. Creep deformation of the Al-8.8Fe-3.7Ce alloy enhances particle coarsening rates while no such effect is noted after fatigue deformation. A high temperature age preceding a low temperature age gives a stable microstructure at the lower temperature. The improved lattice matching previously observed in the equilibrium, tetragonal Al3(V0.875Zr0.125) over the unalloyed Al3Zr phase was also found in the respective metastable cubic phases. GRA

N85-23982# Ames Lab., Iowa.
EFFECT OF OXYGEN ON MECHANICAL PROPERTIES OF Nb-V ALLOY
O. N. Carlson and H. Indrawirawan 1984 9 p Presented at the Am. Inst. of Mining, Metal. and Petroleum Engr. Conf., Detroit, 17 Sep. 1984

(Contract W-7405-eng-82)
(DE85-002681; IS-M-521; CONF-8409179-3) Avail: NTIS HC A02/MF A01

The results of a study of the effect of oxygen on the mechanical properties of a Nb-10 at. % V alloy are described. The effect of oxygen on the tensile yield strength, ductility and strain rate sensitivity were determined as a function of temperature for the range of 78 to 300 K. The effect of vanadium on the oxygen Snoek peak in niobium was determined as a function of vanadium concentration. It was observed that the addition of up to 10 at. % vanadium shifts the oxygen peak temperature upward about 80 K. The activation energy for relaxation of oxygen increases from 108.8 KJ/mole for pure niobium to 154 KJ/mole for 2.5 at. % V and to 200 KJ/mole for 10 at. % V. A possible interpretation of these observations is presented in terms of a substitutional-interstitial solute interaction. DOE

N85-23983# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EXPLORATORY CORROSION TESTS ON ALLOYS IN MOLTEN SALTS AT 900(0)C
R. T. Coyle, T. M. Thomas, and G. Y. Lai (Cabot Corp., Kokomo, Ind.) Oct. 1984 17 p refs Presented at the Am. Inst. of Mining, Metallurgical and Petroleum Engr. Conf., Detroit, 17-19 Sep. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000511; SERI/TP-255-2492; CONF-8409179-1) Avail: NTIS HC A02/MF A01

Exploratory corrosion tests were conducted on 16 commercial alloys in carbonate, chloride, and hydroxide molten salts at 900 C for up to three weeks. Corrosion information, including weight change, observations of the coupons, metallographic examination, and evaluation of the corrosion product by SEM, was obtained on the coupons exposed to these salts. Tests indicated that a number of the alloys showed significant resistance to metal loss in the carbonate molten salt with corrosion rates on the order of several millimeters per year. The corrosion product is an interpenetrating structure of metal from the more noble alloy ingredients and of an oxide made up of the reaction between melt components and oxidizable metals from the alloy. DOE

N85-23984# Sandia Labs., Albuquerque, N. Mex. Metallurgy Dept.
CAST-IRON TECHNOLOGY: METALLOGRAPHIC AND MECHANICAL TESTING RESULTS Progress Report, Sep. 1984
G. W. Wellman Sep. 1984 67 p
(Contract DE-AC04-76DP-00789)
(DE85-002684; SAND-84-1547) Avail: NTIS HC A04/MF A01

The results of an investigation of the deformation and fracture behavior of ductile cast irons with varying microstructures and chemistries are presented. The details of fracture toughness test methods, particularly at high loading rates are discussed. The plans for future work to confirm and clarify data already obtained and to obtain new information on ductile cast irons are listed. DOE

N85-23985# Carnegie-Mellon Univ., Pittsburgh, Pa.
ROLE OF PASSIVE SURFACE FILMS ON CORROSION FATIGUE CRACK INITIATION Final Report, 1 Aug. 1983 - 31 Jul. 1984
I. M. Bernstein, A. W. Thompson, and G. W. Warren Oct. 1984 21 p ref
(Contract DE-AC02-83ER-45042)
(DE85-000438; DOE/ER-45042/1) Avail: NTIS HC A02/MF A01

The electrochemical behavior of the alloy in a passivating solution was characterized. Electrochemical experimentation yielded candidates for a passivating solution for mechanical testing and gave a qualitative idea of repassivation behavior. Fatigue test results showed the necessity of controlling microstructure, specifically grain size. Design of new experimental equipment reached the point where it was possible to isolate the reaction of interest from any interference. Analysis of the microstructural stability in the presence of dissolved hydrogen correlated changes in slip behavior and precipitate coherency with changes in heat treatment and the possibility of the influence of hydrogen on the strain dependence of the coherent/semi-coherent transition as well as the details of the dislocation interaction with the strengthening precipitate. DOE

N85-23986# Purdue Univ., Lafayette, Ind. School of Materials Engineering.
TRACER DIFFUSION IN AN ORDERED ALLOY: APPLICATION OF THE PATH PROBABILITY AND MONTE CARLO METHODS
Hiroshi Sato, S. A. Akbar, and G. E. Murch 1984 63 p refs Presented at Am. Inst. of Mining, Met. and Petrol. Engr. Conf., Detroit, 17 Sep. 1984 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE85-002768; CONF-8409179-5) Avail: NTIS HC A04/MF A01

The tracer diffusion technique was extensively utilized to investigate diffusion phenomena and has contributed a great deal to the understanding of the phenomena. Except for self diffusion and impurity diffusion, the meaning of tracer diffusion is not yet satisfactorily understood. Here an attempt is made to extend the understanding to concentrated alloys. Major interest is directed towards understanding the physical factors which control diffusion through the comparison of results obtained by the Path Probability Method (PPM) and those by the Monte Carlo simulation method (MCSM). The MCSM which can be carried out in a parallel fashion to the PPM provides, with care, numerically exact results. A side-by-side comparison can give insight into the effect of approximations in the PPM. It was found that in the pair approximation of the CVM, the distribution in the completely random state is regarded as homogeneous (without fluctuations), and hence, the fluctuation in distribution is not well represented in the PPM. These examples thus show clearly how the comparison of analytical results with carefully carried out calculations by the MCSM guides the progress of theoretical treatments and gives insights into the mechanism of diffusion. DOE

N85-23987# Colorado School of Mines, Golden.
MICROSTRUCTURE AND PROPERTIES OF FERROUS ALLOY WELDMENTS Progress Report, 1 Apr. - 31 Dec. 1984
D. L. Olson and D. K. Matlock 1984 70 p refs
(Contract DE-FG02-84ER-45066)
(DE85-005582; DOE/ER-45066/T1) Avail: NTIS HC A04/MF A01

The mechanical properties of weldments are evaluated in terms of the heterogeneous microstructural characteristics of weldments. Impression creep data on dissimilar metal weldments and on samples with microstructures which simulate regions within weldments are correlated with theoretical predictions of the deformation behavior of heterogeneous materials. Expressions for predicting weld metal microstructures and properties based on solution thermodynamics and kinetics are under development and tested. The phase stability and mechanical properties of high manganese ferrous weld metal alloys with specific additions of Ni, Cr, Al and Si are investigated. DOE

N85-23988# Brookhaven National Lab., Upton, N. Y.
ROLE OF RESIDUAL STRESSES IN STRESS CORROSION CRACKING IN ALLOY 600 TUBES. PART 1: DETERMINATION OF THROUGHWALL RESIDUAL STRESSES AND THEIR MODIFICATION BY TRANSIENT HEAT TREATMENT
R. Bandy and T. Zemanian 1985 24 p refs Presented at Natl. Assoc. of Corrosion Engr. Ann. Meeting and Mater. Performance and Corrosion Show, Boston, 25 Mar. 1985
(Contract DE-AC02-76CH-00016)
(DE85-004648; BNL-35586-Pt-1; CONF-850311-5-Pt-1) Avail: NTIS HC A02/MF A01

The effect of transient heat treatment on throughwall residual stress distribution of cold worked Alloy 600 tubes was investigated, using electrochemical machining coupled with Sachs analyses for residual stress calculations. Heating for 60 to 150 seconds at 775 to 850 C was used. Specimens were made from one highly cold worked and one lightly cold worked tube. In both cases significant reduction of the magnitude of the stress, and modification of the stress distribution are achieved as a result of the heat treatment. The percentage reduction of the magnitude of the stress

caused by the same heat treatment is generally greater in the lightly cold worked tube than in the highly cold worked one. The implications of the stress relieving heat treatments to mitigating stress corrosion cracking in a specific case are discussed. DOE

N85-23989# Language Services, Nashville, Tenn.
INFLUENCE OF SHORT-RANGE ORDER ON DEFORMATION MECHANISMS IN SOLID SOLUTIONS
N. Clement 1985 27 p refs Transl. into ENGLISH of Conf. paper from Winter School, Aussois, France Presented at the Winter School Conf., Aussois, France, 21-29 Jan. 1984 Prepared for ORNL, Tenn.
(Contract DE-AC05-84OR-21400)
(DE85-006374; ORNL-tr-5184) Avail: NTIS HC A03/MF A01

The characteristics of plastic deformation of short range ordered alloys are part of what are usually called alloying effects that are reflected by the following: a hardening and static and dynamic aging at the macroscopic level; and a heterogeneous deformation involving the collective behavior of the dislocations at the microscopic level. The contribution of the short range order to hardening has been evaluated theoretically by several authors but it is difficult to measure because it is difficult to separate it from other effects. Although it is of an athermal nature, this hardening has been little used at the industrial level because it is difficult to master. In the short range order alloys, the notion of the force of friction that, given its intensity (several times the elastic limit) imposes a collective mode of dislocation propagation is substituted for the notion of strong obstacle, usually in concentrated alloys. By a softening mechanism, the slip is confined to a small number of active planes, thus accentuating the heterogeneity observed. DOE

N85-23990# Argonne National Lab., Ill. Materials Science and Technology Div.
LOCAL PHASE TRANSFORMATION IN ALLOYS DURING CHARGED-PARTICLE IRRADIATION
N. Q. Lam and P. R. Okamoto Oct. 1984 16 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3-6 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-005012; CONF-841246-9) Avail: NTIS HC A02/MF A01

Among the various mechanisms and processes by which energetic irradiation can alter the phase stability of alloys, radiation-induced segregation is one of the most important phenomena. Radiation-induced segregation in alloys occurs as a consequence of preferential coupling between persistent fluxes of excess defects and solute atoms, leading to local enrichment or depletion of alloying elements. Thus, this phenomenon tends to drive alloy systems away from thermodynamic equilibrium, on a local scale. During charged-particle irradiations, the spatial nonuniformity in the defect production gives rise to a combination of persistent defect fluxes, near the irradiated surface and in the peak-damage region. This defect-flux combination can modify the alloy composition in a complex fashion, i.e., it can destabilize pre-existing phases, causing spatially- and temporally-dependent precipitation of new metastable phases. The effects of radiation-induced segregation on local phase transformations in Ni-based alloys during proton bombardment and high-voltage electron-microscope irradiation at elevated temperatures are discussed. DOE

N85-23991# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EXPLORATORY CORROSION TESTS ON MATERIALS AND FLUIDS FOR ADVANCED HIGH-TEMPERATURE MOLTEN-SALT STORAGE
R. T. Coyle, R. W. Burrows, R. M. Goggin, and T. M. Thomas Oct. 1984 48 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002911; SERI/TR-255-2199) Avail: NTIS HC A03/MF A01

Applications for high temperature molten salts in solar energy storage systems are presented and literature is reviewed on the corrosion of ceramics and alloys in molten carbonate, molten chloride, and molten hydroxide. The results of exploratory corrosion studies in these salts at 900 C for up to 21 days are presented. Sixteen metal alloys and eight ceramic materials are evaluated. The carbonate salt results in the lowest corrosion rate for alloys in the three salts investigated and also gives low corrosion rates for ceramics. The metals showing the best corrosion resistance are Cabot 600 or Inconel 600, Cabot 800H, Haynes 556, Cabot 214, nickel, and Hastelloy N. The ceramics showing the best corrosion resistance are high purity alumina and zirconia. DOE

N85-23992# Little (Arthur D.), Inc., Cambridge, Mass.
TECHNICAL AND COST ANALYSES OF MANGANESE NODULE PROCESSING TECHNIQUES AND THEIR SIGNIFICANT VARIATIONS Final Report, 4 Feb. 1983 - 30 Sep. 1984
Sep. 1984 277 p
(Contract NA83SA-C-00637)
(PB85-148815; ADL-REF-89093-F; OME-84/1) Avail: NTIS HC A13/MF A01 CSCL 11F

Literature was reviewed with respect to the metallurgical processing of deep seabed manganese nodules and each of five process options was examined in detail to estimate: optimum production rate; capital and operating costs, as well as that portion of each ascribed to the cost of compliance with environmental regulations; socioeconomic impacts; and, the role of manganese, including the rate of manganese mined but not initially marketed. An annotated bibliography containing 104 references is included. Author (GRA)

N85-23993# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Division.
A STUDY OF FATIGUE CRACK GROWTH IN 2 1/4 CR1MO STEEL. PART 1: THE INFLUENCES OF ENVIRONMENT AND MATERIAL CONDITION
C. A. Hippsley Nov. 1984 55 p refs
(AERE-R-11472) Avail: NTIS HC A04/MF A01

The effects of strength, precipitate microstructure, and temper embrittlement on fatigue of 2 1/4 Cr 1 Mo steel in vacuum, moist air, and hydrogen environments are examined. Base-line data on unembrittled material over a range of heat-treated conditions are presented. A.R.H.

N85-23994# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Division.
MEASUREMENTS OF RADIATION-INDUCED SEGREGATION AND DIFFUSION IN ION IRRADIATED ALLOY USING IMPLANTED MANGANESE
J. E. Hobbs and A. D. Marwick Nov. 1984 40 p refs
(AERE-R-11528) Avail: NTIS HC A03/MF A01

Studies of 30keV manganese implants in nickel under steady 75 keV Ni(+) bombardment at 500 C show that the Mn implant profile broadens by radiation-enhanced diffusion and its peak moves inwards. This movement is due to the drift of Mn atoms in the point-defect flux set up by ion bombardment. The drift velocity was measured as a function of depth. The radiation-enhanced diffusion coefficient of manganese solute can also be calculated directly from the experimental data over a limited range of depths. The behavior of the manganese is interpreted in terms of underlying point-defect concentration profiles, calculated using rate theory or a cascade diffusion theory. The ratio of the measured rates of solute drift and diffusion agrees, within the errors, with the theory of drift induced by a vacancy flux, in the limit of weak solute/vacancy binding. Comparison of the measured diffusion coefficient with the value expected from the calculated vacancy concentration suggests that only (9 + or - 5)% of atomic displacements give rise to freely diffusing vacancies. Author

N85-23995# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Division.
TRAPPING MODEL ANALYSIS OF ANNIHILATION LINE NARROWING IN SOME PLASTICALLY DEFORMED METALS AND ALLOYS
C. F. Coleman, F. A. Smith, and A. E. Hughes Oct. 1984 28 p

refs
(AERE-R-10593) Avail: NTIS HC A03/MF A01

Measurements on the line widths of positron annihilation radiation generated in samples of Al, Ti, IMI-318, IMI-550, Fe, Cr/Mo steel, Ni, Nimonic-115, and Cu deformed by stretching, rolling, or both have been analyzed, using the trapping model for a single type of trapping defect along with an empirical power-law relationship between the generated defect density and the imposed deformation. This relationship for a power of two yields linear hardening. The data are fitted by using the values of S and of M2 for the undeformed material, the values of S and of M2 material in which saturation trapping occurs, and the trapping rate constant as free parameters. This is done for a series of fixed values of the exponent, so that its optimum value can also be found. The optimum exponents cluster about the values one and two, with the former appearing more often, so that in the majority of cases the hypothesis of linear hardening in polycrystalline samples does not appear to be justified. Both rolled and stretched samples of Fe and Cu were examined, with results which suggest significantly different relationships between deformation and defect density for the two types of deformation. Author

N85-23996# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Division.
IMPROVEMENT BY CERIUM AND YTTRIUM ION IMPLANTATION OF OXIDATION BEHAVIOUR OF STABILISED STAINLESS STEEL IN CARBON DIOXIDE
M. J. Bennett, B. A. Bellamy, C. F. Knight, Nicola Meadows, and N. J. Eyre Oct. 1984 32 p refs
(AERE-R-11523; AGR-FPMG-P84511) Avail: NTIS HC A03/MF A01

The influence of the implantation of 1017 cerium and yttrium ions cm -2 was examined upon the early stages of the scale development on the 20%Cr/25%Ni/niobium stabilized (20/25/Nb) stainless steel during oxidation in carbon dioxide at 825 C. Following successively increasing exposure periods, from 5 mins to 153 h, the oxygen uptakes were measured by nucler reaction analysis, the locations of the implanted atoms were determined by Rutherford backscattering, while the compositions of the multicomponent oxide scales, which developed, were followed by X-ray photoelectron spectroscopy and glancing angle X-ray diffraction. The implanted cerium and yttrium atoms became incorporated in the oxide scale as discrete oxide grains to reduce the attack of the 20/25/Nb steel and the possible mechanisms involved are discussed. Author

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-23997 Lehigh Univ., Bethlehem, Pa.
USE OF OPTICAL TECHNIQUES IN STUDIES OF WEAR RATES OF ANODIZED ALUMINUM AND POLYMER COATINGS ON ALUMINUM Ph.D. Thesis
Shem-Mong Chou 1984 228 p
Avail: Univ. Microfilms Order No. DA8429405

The rates of wear of anodized aluminum and polymer coatings on aluminum were determined under conditions that simulate wear of lithographic printing plates by abrasive inks. The rates of wear were determined using optical techniques which employ the interference fringes and absorption bands formed during specular reflection. Wear rates of unsealed anodic coatings, prepared under a wide range of anodizing conditions, vary widely with the rate being proportional to the contact pressure and inversely proportional to the apparent density of the anodic coatings. The rates of wear of polystyrene and poly-n-butylmethacrylate on aluminum anodized under different conditions were also determined. The nature of the polymer and the preparation method for the anodized aluminum substrate affect appreciably the resistance of the polymer to abrasive wear. Applications to the lighographic plate-making were proposed. Dissert. Abstr.

N85-23998*# Springborn Labs., Inc., Enfield, Conn. Dept. of Analytical Chemistry.
DEVELOPMENT OF ACCEPTANCE CRITERIA FOR BATCHES OF SILANE PRIMER FOR EXTERNAL TANK THERMAL PROTECTION SYSTEM BONDING APPLICATIONS Progress Report, 1 Dec. 1984 - 1 Mar. 1985
F. Mikes 10 Apr. 1985 27 p
(Contract NAS8-35818)
(NASA-CR-171428; NAS 1.26:171428; PR-9) Avail: NTIS HC A03/MF A01 CSCL 11G

Concluding tests for the thermogravimetric and FTIR analyses of DC 1200 silane primers are discussed as well as methods for HPLC and GC analyses and for determining titanium and silicon by atomic absorption spectroscopy. Tables summarizes results obtained for residue, ash, titanium, silicone, Si/Ti ratio, OH-absorption, the lap-shear test, and the GC headspace for alcohols. A.R.H.

N85-23999*# National Aeronautics and Space Administration, Washington, D. C.
SINTERED SILICON CARBIDE MOLDED BODY AND METHOD FOR ITS PRODUCTION
M. Omori, M. Sendai, and K. Ohira Mar. 1984 33 p Transl. into ENGLISH of German Patent no. DE-33-26-176 (20 Jul. 1983) p 1-37 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77646; NAS 1.15:77646) Avail: NTIS HC A03/MF A01 CSCL 11G

Sintered silicon carbide shapes are described. They are produced by using a composition containing an oxide of at least one element chosen from the group: Li, Be, Mg, Si, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Zn, Nb, Mo, Ba, Tc, Ta, W and Th as a supplement to known sintering aids. E.A.K.

N85-24000*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENVIRONMENTAL EFFECTS ON THE TENSILE STRENGTH OF CHEMICALLY VAPOR DEPOSITED SILICON CARBIDE FIBERS
R. T. Bhatt and M. D. Kraitchman Apr. 1985 33 p refs Presented at 8th Ann. Conf. on Composited and Adv. Ceramic Mater., Cocoa Beach, Fla.; sponsored by American Ceramic Soc. Prepared in cooperation with Army Research and Technology Labs.
(NASA-TM-86981; E-2519; NAS 1.15:86981;
USAAVSCOM-TR-85-C-4) Avail: NTIS HC A03/MF A01 CSCL 11G

The room temperature and elevated temperature tensile strengths of commercially available chemically vapor-deposited (CVD) silicon carbide fibers were measured after 15 min heat treatment to 1600 C in various environments. These environments included oxygen, air, argon and nitrogen at one atmosphere and vacuum at 10/9 atmosphere. Two types of fibers were examined which differed in the SiC content of their carbon-rich coatings. Threshold temperature for fiber strength degradation was observed to be dependent on the as-received fiber-flaw structure, on the environment and on the coating. Fractographic analyses and flexural strength measurements indicate that tensile strength losses were caused by surface degradation. Oxidation of the surface coating is suggested as one possible degradation mechanism. The SiC fibers containing the higher percentage of SiC near the surface of the carbon-rich coating show better strength retention and higher elevated temperature strength. E.A.K.

N85-24001# Admiralty Marine Technology Establishment, Holton Heath (England).
DEVELOPMENT OF NITRILE RUBBERS AND FOAMS HAVING A HIGH STATIC MODULUS AND LOW CREEP Final Report
C. Hepburn Mar. 1984 31 p refs
(Contract NSM42A/1068)
(BR91465) Avail: NTIS HC A03/MF A01

Nitrile polymers and foams with good dynamic modulus and damping curves; a static shear modulus of 4.0 MN/sqm or higher; and creep rate < 2% per decade were developed. Production steps are outlined. Author (ESA)

N85-24002# Kingston Polytechnic, Kingston-Upon-Thames (England).
SYNTHESIS OF HYDROPHOBIC, CROSSLINKABLE RESINS Annual Report
G. Pritchard, W. E. Douglas, J. S. Ghotra, and A. E. Matthews Dec. 1984 32 p
(Contract DAJA45-84-C-0016)
(AD-A150658; AR-1) Avail: NTIS HC A03/MF A01 CSCL 11/9

This project is concerned with new methods of synthesizing thermosetting resins. The resins to be produced are intended as matrix materials for fiber composites, and other organic products such as adhesives. The resins must have good moisture resistance. That is, the materials must withstand prolonged use under conditions such as 80 C and 95% relative humidity, with good retention of mechanical properties in the dry state at up to 125 C. The fabrication procedures should be comparable in simplicity with those currently in use in industry. The report discusses the approaches available, and covers the literature from 1974 to 1983. The literature discussed is mainly that concerning reactions with potential: (1) in producing prepolymers, and (2) in subsequently carrying out free radical crosslinking reactions. Literature relating to established thermosetting resins, and to novel resins which do not promise hydrothermal stability, is excluded. Brief indications are given of some experimental procedures currently under investigation. The common feature of these procedures is that they utilize the Wittig reaction for producing crosslinking sites. GRA

N85-24003# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
A NOVEL POLYMERIC ORGANOSILAZANE PRECURSOR TO Si3N4/SiC CERAMICS
D. Seyferth and G. H. Wiseman 6 Feb. 1985 22 p
(Contract N00014-82-K-0322)
(AD-A150748; TR-16) Avail: NTIS HC A02/MF A01 CSCL 07/3

The action of basic catalysts such as KH on the ammonolysis product of CH3SiHCl2,CH3SiHNHx, results in formation of polysilazanes of intermediate molecular weight (800-2000). Pyrolysis of these polysilazanes gives ceramic materials, which appear to be mixtures pf Si3N4, SiC and C, in yields of 80-85%. Preliminary experiments aimed at the preparation of ceramic bars, fibers and powder composites are described. GRA

N85-24004# Texas A&M Univ., College Station. Mechanics and Materials Research Center.
RESEARCH ON COMPOSITE MATERIALS FOR STRUCTURAL DESIGN Final Technical Report, 1 Jan. 1982 - 15 Feb. 1984
D. Allen, W. Bradley, S. Groves, J. Ham, and B. Harbert Apr. 1984 311 p
(Contract F49620-82-C-0057)
(AD-A150802; MM-4665-84-5; AFOSR-85-0226TR) Avail: NTIS HC A14/MF A01 CSCL 11/9

Summarized are research activities related to advanced fiber reinforced plastics in the areas of fracture, delamination, distributed damage, residual stresses, moisture effects, and toughening mechanisms in elastic and viscoelastic materials. Also included are abstracts of the six M.S. theses and one Ph.D. dissertation completed during the project period. The Appendix contains full papers and additional abstracts of work done on the project. Author (GRA)

N85-24005# Massachusetts Inst. of Tech., Cambridge.
CHEMICAL INTERPRETATION OF THE RELAXED PERMITTIVITY DURING EPOXY RESIN CURE Technical Report, 1 May - 30 Nov. 1984
N. F. Sheppard, Jr. and S. D. Senturia 30 Nov. 1984 17 p
(Contract N00014-84-K-0274)
(AD-A150955; TR-1) Avail: NTIS HC A02/MF A01 CSCL 13/8

The change in dielectric constant during cure of a diglycidyl ether of bisphenol-A resin (EPON 825) with diamino diphenyl sulfone was studied using microdielectrometry and differential scanning calorimetry. The dipole moments attributable to the epoxide and amine groups were obtained by dielectric measurements on the starting materials, and on related model compounds whose functionality precludes crosslinking. The decrease of the relaxed dielectric constant, Epsilon sub r, during cure can be attributed to the consumption of the polar reactive groups by the crosslinking reaction, and can be correlated with the extent of conversion measured by DSC. The DSC rate data was fit to a kinetic model, and the model used to calculate concentrations of reactive groups versus time. The Frohlich theory, which relates the static dielectric constant to the concentrations and moments of dipoles in the material, was used to interpret the epsilon sub r curing behavior. GRA

N85-24006# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
CHARACTERIZATION OF POLY(ETHYLENE OXIDE) DRAWN BY SOLID STATE EXTRUSION Interim Report
D. J. Mitchell and R. S. Porter 10 Jan. 1985 23 p
(Contract N00014-83-K-0228)
(AD-A150967; AD-E850774; TR-21) Avail: NTIS HC A02/MF A01 CSCL 11/9

Samples of coextruded poly(ethylene oxide) (PEO), drawn to ratios of up to 31, were prepared and studied using techniques of X-ray diffraction, birefringence, differential scanning calorimetry and dynamic mechanical analysis. The amorphous component was found to orient first on draw, this occurring up to a draw ratio of 3 to 4. The crystalline component oriented as the draw ratio was increased from 3 to 12, as seen by the crystalline orientation function fc which increased in that interval from 0.28 to .943. A value of .975 was obtained for fc at a draw ratio of 28. Author (GRA)

N85-24007# Columbia Univ., New York. Dept. of Chemistry.
THE MECHANISMS OF PHENYLACETYLENE POLYMERIZATION BY MOLYBDENUM AND TITANIUM INITIATORS
T. J. Katz, S. M. Hacker, R. D. Kendrick, and C. S. Yannoni 18 Feb. 1985 16 p
(Contract N00014-79-C-0683)
(AD-A150993; TR-9) Avail: NTIS HC A02/MF A01 CSCL 07/3

Polymerizing phenylacetylene, a few of whose molecules are doubly labeled by 13C's on the triple bond, gives poly (phenylacetylene) in which labels are separated by a double bond when the initiator is titanium tetrabutoxide plus triethylaluminum and by a single bond when it is molybdenum pentachloride plus tetraphenytin. This tallies with the idea that the acetylene polymerizations induced by derivatives of molybdenum are olefin metatheses, while those induced by derivatives of titanium are acetylene insertions. The locations of the 13C nuclei were analyzed by NMR spectroscopy. GRA

N85-24008# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
A MODEL FOR THE COMPRESSIVE BUCKLING OF EXTENDED CHAIN POLYMERS
S. J. DeTeresa, R. S. Porter, and R. J. Farris 10 Jan. 1985 51 p
(Contract N00014-83-K-0228)
(AD-A151025; TR-23) Avail: NTIS HC A04/MF A01 CSCL 11/9

A model for the compressive buckling of an extended polymer chain is presented. The application of classical elastic-instability analysis to an idealized polymer chain reveals that the bending rigidity and critical buckling loads for a chain are proportional to the force constants for valence bond angle bending and torsion. Highly oriented polymer fibers are treated as a collection of elastic chains or columns that interact laterally. The critical stresses to buckle this collection of chains are calculated following a procedure

developed to predict the compressive strengths of fiber reinforced composites. Author (GRA)

N85-24009# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.

UNIAXIAL ORIENTATION OF LINEAR LOW DENSITY POLYETHYLENE Interim Report

J. L. Pezzutti and R. S. Porter 10 Jan. 1985 20 p

(Contract N00014-83-K-0228)

(AD-A151037; TR-22) Avail: NTIS HC A02/MF A01 CSCL 11/9

Only a few reported studies have involved the uniaxial orientation of LPDE and even less on LLDPE. It is our purpose to report on characteristics of uniaxially oriented films of LLDPE that contribute to property development. The LLDPE has been co-extruded at 25 and at 80 C layered as ribbons within longitudinally split billets of HDPE. The LLPDE so drawn were characterized by thermal analysis, birefringence, elastic recovery and wide-angle X-ray measurements. As a result we can conclude that the drawing of LLDPE at the low temperature produces a relatively high content of monoclinic crystals. GRA

N85-24010# Los Alamos Scientific Lab., N. Mex.

EFFECT OF ELEVATED-TEMPERATURE NEUTRON IRRADIATION ON FRACTURE TOUGHNESS OF CERAMICS

F. W. Clinard, Jr., G. F. Hurley, R. A. Youngman, and L. W. Robbs 3 Dec. 1984 26 p refs Presented at 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3 Dec. 1984

(Contract W-7405-eng-36)

(DE85-000652; LA-UR-84-3137; CONF-841246-1) Avail: NTIS HC A03/MF A01

Single-crystal forms of MgAl2O4, Y3/Al5O12, and Al2O3 were irradiated in the EBR-2 fast fission reactor to a fluence of 0.3 x 10(26) n/sq m at 1015 K, and to (-)1 to 2 x 10(26) n/sq m at 925 and 1100 K. Fracture toughness was subsequently measured at room temperature by an indentation technique, and radiation-induced defect aggregates were characterized by transmission electron microscopy. A slight increase in toughness of MgAl2O4 was observed, and attributed to interaction of cracks with strain fields around dislocation loops. No significant change was noted for Y3Al5O12, despite the presence of a high concentration of unresolved defect clusters. Fracture toughness of Al2O3 was markedly increased, with the enhancement apparently attributable in large part to impedance of crack propagation by interaction with the irradiation-induced void lattice. DOE

N85-24011# Battelle Columbus Labs., Ohio.

CORRELATION OF UNIAXIAL AND BIAXIAL FRACTURE STRENGTHS OF CERAMICS

D. K. Shetty, J. J. Petrovic (LASL), A. R. Rosenfield, and W. H. Duckworth 1984 11 p refs Presented at the 6th Intern. Conf. on Fracture, New Delhi, 4 Dec. 1984

(Contract W-7405-eng-36)

(DE85-003779; LA-UR-83-3496; CONF-841203-4) Avail: NTIS HC A02/MF A01

The problem of relating fracture strengths of ceramics in biaxial stress states to strengths in uniaxial stress states is examined. Fracture criteria for failure of brittle materials from single flaws were evaluated through controlled-flaw experiments in different stress states and fracture mechanics theory. The derived fracture criteria were employed in a statistical fracture theory framework to predict strengths of ceramics failing from surface flaws. DOE

N85-24012# California Univ., Livermore. Lawrence Livermore Lab.

PRESSURE-DENSITY BEHAVIOR FOR AlN, Al2O3, SiO2, TiB2, AND TiC POWDERS UP TO 3.5 GPa

H. C. Weed Jun. 1984 32 p refs

(Contract W-7405-eng-48)

(DE85-006146; UCID-20302) Avail: NTIS HC A03/MF A01

As part of a program to model the behavior of ceramic bodies suitable for high strength, low density applications, the pressure density characteristics are determined for AlN, Al2O3, SiO2, TiB2, and TiC powders at 20(0)C and a strain rate of 2 x 10(-4)/sec. The pressure range is 0.11 MPa to 3.5 GPa. Both the loading and unloading cycles are examined. The pressure density behavior can be represented by an empirical equation of state similar in functional form to the Birch-Murnaghan equation. The logarithm of the net compaction decreases linearly with the initial density ratio for AlN powder, and may do so for the others. The results constitute a database for testing models of powder behavior such as the P-(ALPHA) model. DOE

N85-24013# California Univ., Livermore. Lawrence Livermore Lab.

COMPUTER SIMULATIONS OF RARE EARTH SITES IN GLASS: EXPERIMENTAL TESTS AND APPLICATIONS TO LASER MATERIALS

M. J. Weber Nov. 1984 15 p refs Presented at Intern. Conf. on Defects in Insulating Crystals, Salt Lake City, 20 Aug. 1984

(Contract W-7405-eng-48)

(DE85-006156; UCRL-90682; CONF-840883-2) Avail: NTIS HC A02/MF A01

Computer simulations of the microscopic structure of BeF2 glasses using molecular dynamics are reviewed and compared with X-ray and neutron diffraction, EXAFS, NMR, and optical measurements. Unique information about the site to site variations in the local environments of rare earth ions is obtained using optical selective excitation and laser induced fluorescence line narrowing techniques. Applications and limitations of computer simulations to the development of laser glasses and to predictions of other static and dynamic properties of glasses are discussed. DOE

N85-24014# Sandia Labs., Albuquerque, N. Mex.

DENSITY AND THERMAL EXPANSION MEASUREMENTS OF SEVERAL MIXED OXIDE GLASSES IN THE SOLID AND LIQUID REGIONS

W. D. Drotning Dec. 1984 46 p refs

(Contract DE-AC04-76DP-00789)

(DE85-006134; SAND-84-2006) Avail: NTIS HC A03/MF A01

The density and thermal expansion of a number of mixed oxide glasses were measured in the solid and liquid regions by gamma densitometry. With this noncontacting technique, both physical regimes can be investigated as the temperature and the glass viscosity vary. Where rate dependent crystallization can occur, the technique allows the continuous measurement of density as the liquid cools to a supercooled glass or a crystalline solid. The liquid phase volumetric thermal expansion coefficient was observed to decrease with increasing PbC content, in contrast to the solid phase linear thermal expansion coefficient. In soda baria phosphate glasses, liquid phase volumetric expansion coefficients were found to vary as the solid phase linear expansion coefficients. Two soda alumina silicate glasses were investigated as well. Measurements on a lithia aluminosilicate glass ceramic were obtained by this method to approximately 400 C above the limit of conventional dilatometry, thereby allowing the measurement of the thermal expansion of high temperature crystalline phases, the liquid phase density. DOE

N85-24015# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.

DYNAMIC SHOCK STUDIES OF PZT 95/5 FERROELECTRIC CERAMIC

L. C. Chhabildas Dec. 1984 33 p refs

(Contract DE-AC04-76DP-00789)

(DE85-006137; SAND-84-1729) Avail: NTIS HC A03/MF A01

Using gas gun and velocity interferometric techniques, the shock loading, the shock release, and the pressure shear response of 95/5 PZT ferroelectric ceramic have been determined up to 4.6 GPa. Results of these experiments indicate that the material undergoes a phase transformation at 0.5 GPa under dynamic loading conditions. Experiments over the stress region 0.9 to 2.6 GPa indicate that the material is in a mixed phase, with the concentration of the FE phase diminishing with increasing stress. The kinetics of pore compaction and crush up behavior dominate

the mechanical material response above 2.6 GPa. Results of pressure shear experiments in combination with that of release wave experiments suggest that dynamic yielding initiates at 0.5 GPa, the pressure at which FE to AFE phase transformation also begins. G.L.C.

N85-24016# Oak Ridge Y-12 Plant, Tenn. Instrumentation and Characterization Dept.
HIGH-TEMPERATURE X-RAY DIFFRACTION STUDY OF COATING-SUBSTRATE COMPATIBILITY IN YTTRIA-COATED GRAPHITE
D. A. Carpenter 18 Jan. 1985 17 p refs
(Contracts DE-AC05-84OS-21400; W-7405-eng-26)
(DE85-005916; Y-2345) Avail: NTIS HC A02/MF A01

A high-temperature X-ray diffraction (XRD) study of the compatibility of yttria (Y_2O_3) coatings on graphite substrates showed a near-surface reaction rate consistent with an autocatalytic model. The model was more appropriate for thicker coatings than for thin ones. The reaction product, yttrium carbide (YC_2), transformed from face-centered cubic to tetragonal during the reaction. The phase stability was dependent upon carbon stoichiometry. DOE

N85-24017# Institut Franco-Allemand de Recherches, St. Louis (France).
PIEZOELECTRIC PLASTICS [PIEZOELEKTRISCHE KUNSTSTOFFE]
F. Bauer 18 Jan. 1983 54 p refs In GERMAN Presented at Conf. Cours Carl Cranz Allumeur, Weil am Rhein, West Germany, 7 Dec. 1982
(Contract BMVg-T/R-760/C0006/C-1706)
(ISL-CO-202/83) Avail: NTIS HC A04/MF A01

The application possibilities of piezoelectric and pyroelectric polyvinyl fluoride are discussed. It is suitable for the production of energy converters under ballistic shock effects, for the measurement of strong shock waves, and in detonation physics. Due to its ferroelectric properties, it is especially useful in fuses and armaments. Other important application domains are infrared detectors, hydrophones, and acoustic transducers. Author (ESA)

N85-24018# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Verbundstrukturen.
DIFFUSION OF WATER VAPOR IN CARBON FIBER REINFORCED PLASTICS (CFRP). MEASUREMENT OF THE DIFFUSION COEFFICIENT UNDER INFLUENCE OF CONCENTRATION
Harald Twardy 1984 66 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-911)
(DFVLR-FB-84-41; ISSN-0171-1342; ESA-TT-911) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23

The diffusion coefficient of water vapor in CFRP was measured as a function of moisture content for epoxy resins code 69 and BSL 914, and their carbon fiber laminates. In sorption and desorption mode, tested materials show considerable variation of the diffusion coefficient with moisture content. Time-dependent influences, which cannot be separated, appear in this dependency. An example with a varying and an equivalent constant diffusion coefficient is calculated and demonstrates differences of calculated moisture profiles in a CFRP laminate. Author (ESA)

N85-24019# National Bureau of Standards, Washington, D.C. Polymer Science and Standards Div.
PREDICTION OF THE LONG TERM STABILITY OF POLYESTER-BASED RECORDING MEDIA Progress Report, Aug. 1983 - Dec. 1984
D. W. Brown, R. E. Lowry, and L. E. Smith Dec. 1984 50 p refs Sponsored in part by National Archives and Records Service
(PB85-160133; NBSIR-84/2988) Avail: NTIS HC A03/MF A01 CSCL 11I

Aging studies with poly(ethylene terephthalate) film base indicate the lifetime is equal to about 1000 years if the material is stored at 20-25C and 50% relative humidity. Concentration changes of acid and alcohol groups that occur as a result of aging have been measured by infrared analysis. Rate constants calculated by this method agree reasonably well with those calculated from acid contents determined by titration. Cross-linked polyester polyurethanes were prepared as models of the binder of magnetic tape. Magnetic tapes were aged and measurements made of the sole content of the binder and its adhesion to the polyester base. It is anticipated that the lifetime of magnetic tapes can be predicted by measurements of binder adhesion. GRA

N85-23768# Imperial Coll. of Science and Technology, London (England). Tribology Section.
HELICOPTER TRANSMISSION LUBRICANTS
H. A. Spikes *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 10 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23781*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSMISSION EFFICIENCY MEASUREMENTS AND CORRELATIONS WITH PHYSICAL CHARACTERISTICS OF THE LUBRICANT
John J. Coy, Andrew M. Mitchell, and Bernard J. Hamrock *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p refs Previously announced as N84-30293 Prepared in cooperation with Army Research and Technology Labs. (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01 CSCL 11G

N85-23784# Pisa Univ. (Italy).
PROBLEMS OF ELASTIC HYDRODYNAMIC LUBRICATION OF HELICOPTER TRANSMISSION GEARS
Dino Dini *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 9 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23785# Army Research Office, Research Triangle Park, N. C. Solid Mechanics Branch.
CHEMICAL-MECHANICAL INTERACTION IN GEARS
Edward Saibel *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 8 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23786# Ecole Centrale de Lyon (France). Lab. de Technologie des Surfaces.
WEAR REDUCTION BY LUBRICANTS IN CONFINED CONTACTS [REDUCTION DE L'USURE PAR LES LUBRIFIANTS DANS LES CONTACTS ETROITE]
Ph. Kapsa and M. Belin *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 11 p refs In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23831*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA SPACE MATERIALS RESEARCH
Darrel R. Tenney, Stephen S. Tompkins, and George F. Sykes *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 301-329 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 11G

N85-23907# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
CONTACTLESS DETERMINATION OF THE CONDUCTIVITY OF THE WHITE PAINT PCB-Z
H. Arends and R. Schmidt *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 11-14 refs (For

primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-24131# Joint Publications Research Service, Arlington, Va.
NONUNIFORM INTERFERENCE COATINGS WITH THICKNESS-DEPENDENT REFRACTIVE INDEX Abstract Only
I. F. Bokhonskaya and T. N. Krylova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 86-87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 26-28 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24132# Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF MgF2 FILM FORMATION AND OPTIMIZATION OF MgF2 FILM DEPOSITION PROCESS Abstract Only
V. P. Poveshchenko, N. G. Kostyuchenko, V. V. Ponkratov, V. M. Kholodov, V. I. Mozgin, and Zh. P. Trofimova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 24-26 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24133# Joint Publications Research Service, Arlington, Va.
WATER-RESISTANCE AND SOME OTHER PROPERTIES OF POLYALKALI FLUOROPHOSPHATE GLASSES Abstract Only
L. V. Fedorova, V. S. Molchanov, L. N. Urusovskaya, and A. N. Zvenigorodskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 88 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad, no. 7, Jul. 1983 p 22-23 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-24020# Martin Marietta Aerospace, Denver, Colo.
ATMOSPHERIC DISPERSION OF HYPERGOLIC LIQUID ROCKET FUELS, VOLUME 2 Final Report, Jun. 1982 - Dec. 1983
W. R. Hass and S. Prince Tyndall AFB, Fla. Air Force Engineering and Services Center Nov. 1984 215 p
(Contract F42600-81-D-1379)
(AD-A150699; AFESC/ESL-TR-84-18-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 21/9

Titan II weapons systems are charged with hypergolic liquid rocket propellants (hydrazine fuel and nitrogen tetroxide oxidizer). These same propellants are used in support of other systems, including the MX missile and the space shuttle. This effort was designed to characterize the interactions of hypergolic liquid rocket propellants and to provide information pertinent to the development of a model to describe the transport and diffusion of airborne combustion products and unreacted vapors from an accident involving these propellants. This report is prepared in two volumes. Volume 2 discusses the chemical and physical interactions of the combustion products with air, and the dispersion of these products in the environment. GRA

N85-24021# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
APPLICATION OF ATOMIC FLUORESCENCE TO MEASUREMENT OF COMBUSTION TEMPERATURE IN SOLID PROPELLANTS Annual Progress Report, 1 Aug. 1983 - 1 Aug. 1984
L. P. Goss and A. A. Smith 31 Dec. 1984 27 p
(Contract F49620-83-C-0138)
(AD-A150733; AFOSR-85-0077TR) Avail: NTIS HC A03/MF A01 CSCL 21/9

Three rare-earth-ion crystals were shown to be good candidates for surface temperature measurements on energetic materials by laser-induced fluorescence. Dy+3:LaF3 displays a thermalization process with an energy gap of 1070/cm, resulting in a fluorescent intensity change of approx. 200 over a 700-K temperature range. Cr+3:Al2O3 (ruby) displays an extreme temperature sensitivity to the lifetime of the R-fluorescence lines. The lifetimes are observed to change by a factor of approx. 230 over a 500-K temperature range. ER+3:CaF2 shows a temperature sensitivity of 20 over a temperature range of 700 K, as measured by the lifetime of its energy level fluorescence line. GRA

N85-24022# Southwest Research Inst., San Antonio, Tex.
JP-8 AND JP-5 AS COMPRESSION IGNITION ENGINE FUEL Interim Report, Jul. - Dec. 1984
J. N. Bowden, E. C. Owens, and M. E. LePera 15 Jan. 1985 35 p
(Contract DAAK70-85-C-0007; DA Proj. 1L1-62733-AH-20)
(AD-A150796; AFHRL-192) Avail: NTIS HC A03/MF A01 CSCL 21/4

For many years, aircraft turbine fuel JP-5 was used in diesel engines as an alternate fuel for DF-2, and is listed as such in Army Regulation 703-1. Since 1965, diesel engine endurance tests have been conducted in a variety of compression-ignition engines using JP-5 or JP-8 as the fuel and comparing performances with DF-2. None of these tests showed engine failures or excessive wear attributable to the use of kerosene-type aircraft turbine fuels, although slightly reduced fuel injection delivery volumes and lower power output were experienced in most engines, due to lower viscosity and lower heat content of JP-5 and JP-8 compared to DF-2. These results not withstanding, periodically, concerns are raised about the use of JP-5 and JP-8 in diesel engines over long periods in the 500 to 1000-hour time frame, especially in new engine designs. This report is primarily an annotated bibliography of 23 references consisting of technical notes, letters, letter reports, and interim reports, on the subject of using aircraft turbine fuels JP-5 and JP-8 in diesel engines. GRA

N85-24023# Department of Energy, Bartlesville, Okla. National Inst. for Petroleum and Energy Research.
TRENDS OF PETROLEUM FUELS
Ella Mae Shelton and Paul W. Woodward Feb. 1985 34 p refs
(Contract DE-FC01-83FE-60149)
(DE85-000116; NIPER-22) Avail: NTIS HC A03/MF A01

Trends in properties of motor gasolines for the years 1942 through 1984; diesel fuels for the years 1950 through 1983; aviation fuels for the years 1947 through 1983; and heating oils for the years 1955 through 1984 were evaluated. Various companies throughout the country obtain samples of motor gasolines from retail outlets and refinery samples for the other surveys, and analyze the samples using American Society for Testing and Materials (ASTM) procedures. A summary was assembled from data in 83 semiannual surveys for motor gasolines that shows trends throughout the entire era from winter 1942 through 1943 to the present. Trends of properties including octane numbers, antiknock ratings, distillation temperatures, Reid vapor pressure, sulfur and lead content are shown. DOE qr

N85-24024# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MODEL OF NORMAL AND EROSIVE BURNING OF COMPOSITE PROPELLANTS
Jean-Claude Godon 1984 148 p refs In FRENCH; ENGLISH summary
(ONERA-NT-1984-3; ISSN-0078-3781) Avail: NTIS HC A07/MF A01

The processes governing the normal burning of composite propellants are described and the causes of erosive combustion are interpreted. Numerical models are created for autonomous burning of ammonium perchlorate and normal combustion of composite propellants. An initial coupling with a turbulent boundary layer calculation, with parietal injection, evaluates the intensification of the combustion due to a high specific mass rate of flow sweeping the surface in erosive regime. The results show good agreement with the available experimental data. Author (ESA)

N85-24025# Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY ON THE COMBUSTION OF NITRAMINE PROPULSION POWDER UP TO 1500 MPa AND COMPARISON OF THE PERFORMANCE WITH THAT OF CLASSICAL PROPULSION POWDERS [ETUDE DE LA COMBUSTION D'UNE POUDRE PROPULSIVE A BASE DE NITRAMINE JUSQU'A DES PRESSIONS DE 1500 MPA ET COMPARAISON DE SES PERFORMANCES AVEC CELLE DE POUDRES PROPULSIVES CLASSIQUES]
D. Grune 28 Jan. 1983 17 p In FRENCH Presented at 8th Symp. on Augmentation des Performances de Balistique Interieure des Armes a Tube, Swisttal-Heimerzheim, Federal Rep. of West Ger., 24-26 Nov. 1982
(Contracts BMVg-T/R-760/B-013/B-3713; BMVg-T/R-760/C-0015/C-1715)
(ISL-CO-203/83) Avail: NTIS HC A02/MF A01

A powder composed of 88% nitroamine and 12% polysoprene binder was tested using a pressure chamber and a pressure transducer. Using 0.45 mm flakes a linear dependance of the velocity combustion with pressure is demonstrated up to 75% of the maximum pressure. Comparison with conventional powders shows that nitroglycerin powder produces a higher projectile emission velocity with a lower maximum pressure. The performance of the nitroamine powder is superior to that of the nitrocellulosic powders. Author (ESA)

N85-24026# Institut Franco-Allemand de Recherches, St. Louis (France).
A TWO-STEP BOMB TO DETERMINE THE INFLAMMABILITY OF PROPELLANT CHARGE POWDERS [EINE ZWEISTUFENBOMBE ZUR MESSUNG DER ENTFLAMMBARKEIT VON TREIBLADUNGSPULVERN]
D. Grune 9 Feb. 1983 20 p ref In GERMAN Presented at 8th Symp. on Augmentation des Performances de Balistique Interieure des Armes a Tube, Swisttal-Heimerzheim, West Germany 24-26 Nov. 1982
(Contracts BMVg-T/R-760/B-013/B-3713; BMVg-T/R-760/C-0015/C-1715)
(ISL-CO-211/83) Avail: NTIS HC A02/MF A01

An experimental method to classify propellant charge powders with respect to their inflammability, and to determine the unstationary combustion evolution during and after inflammation by pressure measurements was developed. A two-step bomb was built to experimentally determine delay time till inflammation of a mass. Gas pressure evolution after the burnup of the primary and secondary charge was measured. The pressure decrease due to the heating of the secondary charge enables the heat in the powder layer to be calculated, improving the inflammability estimation.
Author (ESA)

N85-24027# Institut Franco-Allemand de Recherches, St. Louis (France).
COMPONENTS OF THE COMBUSTION GASES OF PROPELLANT CHARGE POWDERS AFTER REACTION IN THE HIGH PRESSURE BOMB IN THE PRESSURE RANGE UP TO 1000 MPa. PART 1: NITROGLYCERINE POWDER GB Pa 125 [KOMPONENTEN DER VERBRENNUNGSGASE VON TREIBLADUNGSPULVERN NACH UMSETZUNG IN DER HOCHDRUCKBOMBE IM DRUCKBEREICH BIS 1000 MPA. TEIL 1: NITROGLYCERINPULVER GB PA 125]
F. Aulinger 13 May 1983 21 p refs In GERMAN Presented at Comm. du Conseil Consultatif des Rech. et Etudes Meeting on Balistique Interieure, St. Louis, France, 24 Mar. 1983
(Contract BMVg-T/R-760/C-0015/C-1715)
(ISL-CO-217/83-Pt-1) Avail: NTIS HC A02/MF A01

The main and secondary flue gas components of the hot nitroglycerine powder GB Pa 125 were examined. The pure mass spectrometric analysis of the cooled flue gases shows an unexpected distribution of the main components H2, CO2, CO, H2O, and N2 which agrees with a theoretical prediction if a correction of the relative contributions of CO2 and CO is made. The missing CO2 and CO quantities can most probably be retrieved in nongaseous Fe-O-C compounds and solid carbon. The creation mechanism of the secondary components CH4 and NH3 cannot be explained since the measured quantities differ very much from the theoretical values. Author (ESA)

N85-24028# Institut Franco-Allemand de Recherches, St. Louis (France).
INVESTIGATION OF THE CHOKING EFFECT OF AN INERT GRANULAR BED ON AN IGNITION GAS JET CHARGED WITH PARTICLES [UNTERSUCHING ZUR DROSSELWIRKUNG EINES INTERPULVERBETTS AUF PARTIKELBELADENE ANZUENDSCHWADEN]
H. Mach, U. Werner, and H. Masur 19 Oct. 1983 24 p refs In GERMAN; ENGLISH summary Presented at Symp. on Augmentation des Performances de Balistique Interieure des Armes a Tube, Mannheim, West Germany, 13 Oct. 1983
(ISL-CO-235/83) Avail: NTIS HC A02/MF A01

The flow of ignition gas through a granular bed of propellant dummy loads was investigated. The dummy loads have various lengths, the volume density of the load being 0.61. Four different types of pyrotechnic igniters were developed for igniter studies of solid gun propellants. Time resolved velocity measurements and measurements of the optical extinction at the exit of each of the powder columns were performed using a laser Doppler velocimeter and a laser detector system. The choking effect of the granular bed is deduced showing a time variable axial distribution of the velocity and the relative flux of the particulate phase of the igniter flow. From comparison with earlier measurements it is concluded from these data that deceleration of the gases down to low velocities is important in ignition. Author (ESA)

N85-24029# Sandia Labs., Albuquerque, N. Mex.
INVESTIGATION AND OPTIMIZATION OF FUEL PRODUCTION USING DYE-BASED TRANSITION METAL COMPLEXES AS CHARGE-TRANSFER INTERMEDIATES Annual Report, Aug. 1983 - Aug. 1984
J. A. Shelnutt and D. S. Ginley Aug. 1984 244 p refs Sponsored by Gas Research Inst.
(PB85-161941; GRI-84/0197) Avail: NTIS HC A11/MF A01 CSCL 21D

Metalloporphyrins offer promising properties for photosensitizing and catalyzing reactions of interest. Because of the detailed understanding of these molecules at a fundamental level, they provide a unique chemical system for investigations of the basic photophysical processes controlling desired chemistries. Metalloporphyrins perturbed systematically either by structural modifications or by incorporation into various environments were examined by resonance Raman difference spectroscopy, ultraviolet/visible absorption spectroscopy, and other spectroscopic and electrochemical probes. Perturbations on the photosensitizing chromophore resulted in systematic changes in its spectra and its chemical properties. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-24030# Illinois Univ., Urbana. Dept. of Civil Engineering.
ANALYSIS OF SLABS-ON-GRADE FOR A VARIETY OF LOADING AND SUPPORT CONDITIONS Annual Report, 1 May 1983 - 30 Sep. 1984
A. M. Ioannides, J. Donnelly, M. R. Thompson, and E. J. Barenberg Dec. 1984 565 p
(Grant AF-AFOSR-0143-83)
(AD-A150965; AFOSR-85-0083TR) Avail: NTIS HC A24/MF A01 CSCL 13/2

This study is concerned with analytical and numerical procedures applied to slab-on-grade pavements, treated as plates on elastic foundation, with particular emphasis on the possibilities offered by the automated digital computer. In the first part of the

report, analyses employing the dense liquid foundation are examined. This includes an exhaustive reexamination of Westergaard's work, which established conclusively the correct form of the Westergaard equations and pointed out that the new edge stress formula should be used. Closed-form solutions for a plate on a dense liquid or an elastic solid foundation are assembled in a computerized compendium called WESTER. The second part of the study focuses on elastic solid analyses of the same problem. Pickett's Chart for edge stress is recalculated using computerized numerical integration, and the results is incorporated in computer program H51ES. Three additional computer codes are developed: (1) A method using the concept of concordant deflections for axisymmetric plates (program CFES); (2) A finite difference approach for rectangular plates (program FIDIES); and (3) A finite element solution for rectangular plates (incorporated into program ILLI-SLAB). GRA

N85-24031# Los Alamos Scientific Lab., N. Mex.
RAILGUN CONDUCTOR HEATING FROM MULTIPLE CURRENT PULSES
Jerry F. Kerrisk Sep. 1984 27 p refs
(Contract W-7405-eng-36)
(DE85-005333; LA-10184-MS) Avail: NTIS HC A03/MF A01

A numerical technique for solving current and thermal-diffusion problems in railgun conductors was used to study Joule heating in rails that are subject to multiplecurrent pulses. Copper rails that are 25 mm high by 12.5 mm wide with a 20-mm-square bore and a current pulse with 1-MA peak current and 1-ms pulse width at half maximum were assumed. This combination of parameters is sufficient to accelerate an 80-q projectile to 2-3 km/s with each current pulse. Three parameters were varied in the analysis: the repetition rate or current pulse frequency (3.3 to 100 Hz), the coolant coolant-channel distribution in the rail. Results in the form of plots of rail temperatures as a function of time, are used to illustrate the acceptability or unacceptability of particular combinations of these parameters for operation at steady state. An uncooled rail is not acceptable for steady-state operation. Repetition rates of about 30 Hz are acceptable with the higher coolant heat-transfer coefficient and the best coolant-channel distribution; this includes cooling the rail exterior surface. DOE

N85-24032# Jeppson (Morris R.), Carmel, Calif.
MICROWAVE METHODS FOR PAVING Final Report
Morris R. Jeppson 7 Dec. 1984 76 p
(Contract DE-FG01-84CE-15173)
(DE85-004194; DOE/CE-15173/T1) Avail: NTIS HC A05/MF A01

Important highway pavement maintenance and rehabilitation needs were identified and microwave methods and equipment that could be profitably used for this work are proposed. The major emphasis in the US paving industry is on maintaining streets, roads, highways, and bridges and to restore or upgrade them when necessary. Lacking the inventory and projections of future maintenance work, an attempt to classify future road maintenance work is presented. DOE

N85-24033# Laboratorium Elektronische Ontwikkelingen voor de Krijgsmacht TNO, Oegstgeest (Netherlands).
ANALYSIS AND DESIGN OF HYDRAULIC SERVO SYSTEMS WITHIN THE SCOPE OF THE IMPROVEMENT OF A FATIGUE TESTING INSTALLATION OF THE ROYAL DUTCH ARMY
S. J. Uitterdijk Oct. 1984 53 p refs In DUTCH; ENGLISH summary
(Contract A81/KL/031)
(LEOK-TR-1984-09; TDCK-79659) Avail: NTIS HC A04/MF A01

Hydraulic servosystems were analyzed and designed in order to improve pulsed machinery. Behavior of a linear hydraulic motor is analyzed and the manner in which related control systems, applied in various kinds of feedback, can be developed is described. The efficiency of the applied theory is demonstrated on the fatigue testing installation. It is shown how the required feedback amplifications can be simply calculated. Author (ESA)

N85-24034# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ENGINEERING AND EQUIPMENT
9 Feb. 1984 107 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-84-001) Avail: NTIS HC A06

Topics in engineering and equipment are covered. Some subject areas are: Marine and shipbuilding; Nuclear energy; Nonnuclear energy; Industrial technology; Turbine and engine design; Navigation and guidance systems; High energy devices, optics and photography; Fluid mechanics; Mechanics of solids; and Testing materials. For individual titles, see N85-24035 through N85-24139.

N85-24035# Joint Publications Research Service, Arlington, Va.
DROP OF COOLANT TEMPERATURE IN INDIVIDUAL COMPONENTS OF SOLAR HEATING SYSTEM Abstract Only c44
G. A. Abdullayev, R. R. Avezov, O. Azimov, and K. B. Khozhiyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 13 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 49-52 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Temperature drops in low temperature heating systems are very critical and must be minimized in each individual component of such a system. The mean temperature of the coolant in a solar heating system is considered. The drops of this mean temperature in the first loop and in the second loop, relative to the temperature of the radiation receiving surface of the heat collector are calculated on the basis of the corresponding equations of heat balance. The drop of the mean coolant temperature from first loop to second loop is calculated. Numerical data are given for an RSG-2 stamped steel radiator serving as heat collector in a solar heating plant. Author

N85-24036# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE EVALUATION OF COST EFFECTIVENESS OF SOLAR ELECTRIC POWER PLANTS Abstract Only c44
D. Yu. Ibragimov and A. I. Filatov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 14 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 34-42 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The cost effectiveness of constructing a solar heating and electric power plant is evaluated on the basis of a compatibility analysis of its combination with a thermal electric power plant and a boiler-type heating plant, taking into account comprehensively economic factors as well as power requirements. Two variants of such a combination are considered and compared, assuming equal heating power and equal electric power respectively. Equations are set up for each variant covering fixed and variable costs of generating electric power and generating heat, as basis for comparing the two variants and optimizing them with respect to normalized annual total cost. Nomograms plotted for convenient numerical calculation of maximum economically worthwhile capital investment in a solar heating and electric power plant, depending on changes in various operating parameters, reveal that, as the time for constructing such a plant becomes longer, this maximum worthwhile investment in it increases for variant 1 and decreases for variant 2. Author

N85-24037# Joint Publications Research Service, Arlington, Va.
USE OF HEAT PIPES FOR HEAT COLLECTION AND TRANSMISSION IN SOLAR PLANTS Abstract Only c44
T. Z. Abidov, U. Kh. Gaziyev, and G. Ya. Umarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 14-15 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 27-29 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A heat pipe was designed for use as heat collector in solar plants. It has a siphon rather than capillary construction with uniform wall thickness over its entire length. Its 0.7 m long evaporation zone, placed in the focal plane of a parabolocylindrical concentrator, was connected to the solar heat cell. Its 0.2 m long condensa-

tion zone, separated from the evaporation zone by a 0.15 m long adiabatic zone, was connected to the heat collector which contains the working fluid. The heat pipe was in an inclined position so as to facilitate gravity return flow of the condensate into the evaporation zone. The amount of water was sufficient to completely immerse the evaporation zone in the presence of vapor and condensate. The efficiency of this heat pipe was measured as function of the input power at constant rate of water flow (10 and 20 1/h respectively) through the calorimeter with the inlet temperature varied over the 50-80 deg C range. A maximum efficency reaching and exceeding 90% was attained at an input power of 300 W or higher. Author

N85-24038# Joint Publications Research Service, Arlington, Va.
POWER PLANTS OF MODULAR CONSTRUCTION WITH QUASI-PARABOLOIDAL CONCENTRATORS OF SOLAR ENERGY Abstract Only **c44**
V. K. Baranov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 15 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 17-22 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Solar electric power plants with parabolocylindrical concentrators are not as efficient as those of the tower type and, therefore, another modular construction is considered. The idea is to concentrate solar energy on a small spot and to locate the power plant, which consists of a heat collector and a Stirling, Brayton, or Rankine engine with an electric generator, near that spot. The solar energy concentrator is designed and built to perform like a paraboloidal mirror. The first 13 concepts are based on using plane, spherical, or double curvature facets made of silicate glass with silver backing or polymer film with aluminum coating. The next 4 concepts are based on using aluminized polymer film and forming it by means of air inflation. The last 5 concepts are based on using plane or cylindrical Fresnel mirrors, or a Fresnel lens. These concepts are in various stages of develoment and production. Author

N85-24039# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF HOLDING JIGS FOR OBJECTS OF ROBOTIZED ASSEMBLY Abstract Only **c37**
O. N. Vertogradov, D. L. Krolik, and M. P. Poyda *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 18 Transl. into ENGLISH from Pribory i Sistemy Upr. (Moscow), no. 8, Aug. 1983 p 34-35 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

For the purpose of formalizing a consistent terminology, a classification of holding jigs is proposed which applies particularly to assembly and other processing of miniature product parts. A holding jig is defined as a transfer device and characterized by five indicators encodable so that up to 3.2.3.1.3+3.2.3.1.4 = 108 different holding jigs can be covered. The first digit indicates the degree of usage (single, multiple, combination). The second digit indicates the number of type sizes a jig can hold (one, many). The third digit indicates the correspondence (full, partial, none) between the relative positioning of parts in the jig and their relative positioning in the assembled product, this indicator being particularly important for products with flanges. The fourth digit indicates whether or not parts of the same type of jig construction. The four main forms of holding jig where parts do not touch one another are a harness, a band, a honeycomb, and a strip. Author

N85-24040# Joint Publications Research Service, Arlington, Va.
CONTROLLABLE MOVEMENTS OF ELASTIC MANIPULATOR WITH THREE DEGREES OF FREEDOM Abstract Only **c54**
A. A. Gukasyan *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 19 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 3, Mar. 1983 p 12-20 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The kinematics and the dynamics of a programmable automatic manipulator are analyzed, allowing for elastic compliance of its single link and regarding a perfectly stiff one as a limiting case only. A manipulator with three degrees of freedom is considered, one to which the linear theory of thin straight beams is applicable. The equations of equilibrium for such a manipulator carrying a load are derived in generalized Lagrange coordinates from corresponding expressions for kinetic energy and potential energy. For deriving the equation of kinematic control, the manipulator is assumed to be driven by three motors according to prescribed laws of motion in terms of the three generalized coordinates as functions of time. For deriving the equation of dynamic control, the manipulator is assumed to be driven by three motors in accordance with prescribed laws governing the two forces and one moment as functions of the three generalized coordinates and time. The analysis concludes with control of the two forces and one moment on the manipulator link for a prescribed motion of the load. Author

N85-24041# Joint Publications Research Service, Arlington, Va.
MILLING OF SPHERICAL ZONES IN PARTS Abstract Only **c37**
V. D. Miroshnichenko and G. P. Kochura *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 19-20 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 36 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Fabrication of spherical surfaces by end milling requires a predetermination of the process parameters for producing a spherical zone. A relation for the angle alpha at which the geometrical axes of mandrel and cutter shaft must intersect to ensure minimum labor and minimum total cost is established. This relation is alpha = sin - 1 x r/R + or - sin - 1 x alpha/R (R- radius of spherical surface to be machined, r- radius of cutter, alpha-base radius of boss not to be machined, + or - corresponding to a boss outside the cutter point trajectory and to a boss under the cutter face respectively). This formula applies to milling of large spherical surfaces with a small cutter, as in fabrication of a die for molding Fresnel lenses or in preliminary aspherization of parts with central axis of symmetry. Author

N85-24042# Joint Publications Research Service, Arlington, Va.
NEW EQUIPMENT COMPLEX KASKAD 2 FOR AUTOMATIC CONTROL Abstract Only **c37**
B. P. Gavrilov, A. A. Slavin, and Yu. M. Shapiro *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 20 Transl. into ENGLISH from Teploenerg. (Moscow), no. 10, Oct. 1983 p 5-9 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The Kaskad automatic control equipment complex produced for some time at the Moscow Thermal Automation Plant has been recently updated and supplemented. The new Kaskad 2 complex consists of 3 regulating modules, 4 deflection signal shaping modules, 7 static signal conversion modules, and 3 dynamic signal conversion modules. These modules are variously combined into 11 different functional units. The first production set of this complex has been operating in the Konakovo GRES since 1982. Author

N85-24043# Joint Publications Research Service, Arlington, Va.
EQUIPMENT FOR PERFORMING SURFACES OF OPTICAL PARTS Abstract Only **c37**
V. A. Balabanovich, I. N. Vereshchako, V. T. Derbentsev, I. N. Medvedev, A. I. Konovalova, and V. B. Mlechko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 21 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 52-58 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A survey is made of available equipment built by foreign manufacturers for mechanical treatment of optical parts. This survey covers spraying machines (Whilhelm Bothner, Meyer & Burger A. G., Dama, Erich Dern, Leico), circular-grinding machines (Dama, Leico, LOH), universal grinding machines (Wilhelm Bothner, Rogers & Clarke, CMV Interamerica, Dama, Kyoritsu Seiki, LOH,

R. Howard Strasbangh), and drilling machines (Meyer & Burger A. G., Erich Dern). Author

N85-24044# Joint Publications Research Service, Arlington, Va.
POWER CONTROL OF INDUCTION EQUIPMENT FOR FOUNDING OPTICAL GLASS IN ARRAY OF PLATINUM CRUCIBLES Abstract Only c37
V. S. Ryskov, V. S. Chudnovskiy, and N. A. Kudrin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 21 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 59 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A system developed for this application operates with a central power supply through a thyristor type frequency converter for 2-phase or 3-phase loads, with automatic power and temperature control for each crucible independently. The power is controlled at the frequency converter, by means of a rectifier and an inverter, both the fundamental component and the third harmonic of the inverter output current as well as the rectifier d.c. output voltage being adjusted until the mismatch signal is reduced to zero. Other components of this system include thermocouples affixed to the side walls of the crucibles and acting as temperature transducers, and a high precision regulator with measuring devices in each control channel. The crucibles are protected against overheating due to equipment faults by KSP-3 devices also used for visual inspection. The temperature of a crucible can be maintained constant within + or - 1 C. Author

N85-24045# Joint Publications Research Service, Arlington, Va.
SMALL-SIZE MEASURING GAUGES FOR METAL CUTTING MACHINE TOOLS Abstract Only c35
B. M. Levin, V. N. Lyapkov, Yu. A. Myasnikov, and L. N. Kirsanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 22 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 19-21 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Recently two new models of suspension type optical measuring gauges have been developed with a 0.01 mm scale division, for measuring displacements of movable parts in metal cutting machine tools. The first one is the IG-98 consisting of an STs-80 incandescent lamp, a light filter, two reference rulers, two objectives, a light splitter cube, four plane mirrors, two condenser lenses, a graduated circle and a magnifying glass. The second one is the IG-119 consisting of an STs-61 incandescent lamp, a light filter, a rectangular prism with cover, two reference rulers, two objectives, a light splitter cube, one mirror, one condenser lens, a cylindrical shield and a magnifying glass. A complete accuracy analysis of both instruments indicates that two out of the seven principal error components are negligible, namely the angular error of the null adjustment guides and the temperature error referred to the plane of one of the reference rulers. Author

N85-24046# Joint Publications Research Service, Arlington, Va.
FABRICATION OF TURBINE PARTS WITH TRANSPORTABLE TOOLS Abstract Only
T. I. Khokhlova and R. G. Kats *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 22-23 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 43-46 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Lines of transportable machine tools were developed in the United States, the FRG, and the GDR for frameless' fabrication of turbine parts, especially large ones with hardly any limitation on size, and their assembly in situ. This method was found to be more efficient and economical than transporting the parts from one machine tool to another and to assembly, the cost of transportable machine tools being much lower than that of necessarily heavier stationary ones with required foundations. These machine tools include lathes for turning, boring, milling, grinding, drilling operations to be performed outside or inside the turbine housing. Two items of interest are the model UBV160 transportable combination tool with lathes for all these operations built by the Reimmann GmbH in the FRG and the transportable machine tool on a special base plate for all assembly operations, including control of axial and radial play, blade setting and trimming, and runner banding. Author

N85-24047# Joint Publications Research Service, Arlington, Va.
NEW TECHNOLOGY OF FINISH CUTTING TEETH IN LARGE GEAR BLANKS Abstract Only
G. G. Ovumyan, Yu. A. Lipatov, and S. A. Khurkhriy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 23 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 27-29 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A new technology was developed for finish cutting teeth in large gear blanks to ensure the necessary precision and surface smoothness. An analysis of the cutting process relative to gear blanks with a hardness of bhn $<$ 320 has revealed that the wear on the back surface of the tool is determined essentially by the length of the cutting (friction) path. The known relations characterizing the dependence of the length of that path on other process parameters (tool radius, tool travel, depth of cut, angle of tooth profile) and the dependence of the depth of wear on the length of that path serve as the basis for optimizing the process. These considerations have resulted in the design of a double-thread cutter consisting of two cutting blades screwed into an arbor, their orientation relative to the cutter axis adjustable by means of support plates and a pin. The finish cutting can be combined with preliminary rough cutting and, furthermore, this cutter is more simple to produce and operate than a multithread cutter. Author

N85-24048# Joint Publications Research Service, Arlington, Va.
AXIAL BEARINGS WITH LEVER-TYPE EQUALIZER SYSTEM Abstract Only c37
Ye. I. Zaretskiy, L. P. Serezhkina, and Yu. P. Tomkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 24 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 8-10 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

In order to realize the maximum load capacity of a segmental axial bearing, it is necessary to equalize the load over all segments. This is achieved by means of a lever system in Kingsbury thrust bearings produced at the Kharkov Turbine Manufacturing Plant and operating in large steam turbines. Each bearing shoe rests on an upper lever arm, the upper lever arms under each two adjacent shoes being balanced on a lower lever arm linking both until the loads on all shoes around the collar were equalized and the effect of inevitable manufacturing or installation imprecision thus eliminated. The effectiveness of this method is demonstrated on 8-shoe and 10-shoe bearings with the ripple of the load distribution and the skew of the temperature distribution smoothed out almost completely by the action of levers. Some elastic deformation of the levers occurs as load is applied to the bearing, the magnitude of this deformation becoming comparable with that of the axial shaft movement under heavy thrust loads. Author

N85-24049# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN USE OF OPTICAL THEODOLITE FOR MACHINE CONSTRUCTION Abstract Only
L. M. Shereshevskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 24 Transl. into ENGLISH from Izmeritel. Tekhn. (Moscow), no. 6, Jun. 1983 p 33-35 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An optical theodolite, an instrument of small size and weight featuring a high-precision horizontal dial, was successfully used in production of forging and pressing equipment at the Voronezh plant. Such a TV-1 theodolite, together with a contact-type indicating device and a mechanism for centering the machined part, is included in a turret goniometer for angular alignment and control of cutting operations. Its micrometer has 1 inch scale

divisions, the instrument is designed to give readings with a high degree of stability and reproducibility with the standard deviation of one measurement not exceeding 5 inches. It is particularly useful in production of parts with variable spacing and cross section of grooves or slots, including curvilinear ones. With a universal adapter plate on which guide prisms and an interchangeable gauge pin are mounted, this theodolite can also be used in production of large bevel gears: the same instrument for a wide range of gear sizes, diametral pitches, and tooth profiles. Using the maximum of standard components, this theodolite can be easily assembled at any manufacturing plant. Author

N85-24050# Joint Publications Research Service, Arlington, Va.
PNEUMOHYDRAULIC DRIVE Abstract Only c37
A. N. Nemkovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 25 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 8, Aug. 1983 p 46 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A pneumohydraulic drive was invented (USSR patent disclosure No 973,956) for disengaging a machine tool upon loss of sealing in its high-pressure cylinder. The main component of this drive is a hydraulically (oil) driven piston compressing or expanding air inside a cylindrical cavity. Through two controllable valves, one under the piston and one above the piston, the latter drives a 3-position distributor (disengagement, preliminary re-engagement, final re-engagement) with the aid of single-stage or 2-stage pneumohydraulic transducers. The performance of this drive needs to be further evaluated for various applications. Author

N85-24051# Joint Publications Research Service, Arlington, Va.
CLUTCHLESS MECHANISM FOR ENGAGEMENT OF FORGING PRESS Abstract Only c37
V. A. Kozhevnikov, G. D. Pekelis, and R. V. Lażarev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 25-26 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 8, Aug. 1983 p 18 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A mechanism for engagement of forging presses is described in which the clutch was replaced with an electromagnetic contactless coupling. The mechanism includes an electric motor with a flexible flywheel, a crankshaft with eccentric, and a connecting rod. The coupling consists of electromagnets (coils wound on cores) with return springs acting on the electromagnet cores through pins, adjustable nuts, disks, and tapered actuators. The coupling is controlled from a switchboard for the electromagnet coils. Automatic cutout of the actuators is provided in the case of overload. Elimination of the clutch saves 20 to 55% energy in starting and stopping, eliminates impact loads, reduces the noise level by a factor of 2.6 to 3, reduces consumption of compressed air by a factor of 5 to 17, lengthens the life of a press, and contributes to a more economical design and production of presses. Author

N85-24052# Joint Publications Research Service, Arlington, Va.
MILLING MACHINE WITH NUMERICAL PROGRAMMED CONTROL FOR CUTTING TEETH Abstract Only c37
R. N. Usubamatov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 26 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 8, Aug. 1983 p 16-17 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A universal milling machine for gear cutting with slotting head, planning head, turnable spindle and numerical programmed control was developed on the basis of analysis and synthesis of tool and blank motion along three space coordinates. It is designed in accordance with appropriate kinematic relation governing the gear cutting process. Numerical control is effected by means of an indexing plate with pins and covers a wide range of gear shapes and sizes. This machine replaces several special-purpose gear cutting machines used in small-scale production. Author

N85-24053# Joint Publications Research Service, Arlington, Va.
NOVEL DRIVES FOR MACHINE TOOLS Abstract Only c37
V. M. Pestunov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 26-27 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 8, Aug. 1983 p 10-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Three drives for machine tools were invented. The electric drive for a drill (USSR patent disclosure No 407652) includes a differential and a worm gear for converting rotary motion to translatory motion, automatic feed control under load being effected by adjustment of the driving torque through adjustment of the excitation current in the coil of the electromagnetic coupling. The two-speed electric drive for a hone (USSR patent disclosure No 795871) simplifies the construction and the operation of such a machine tool, controlling its reciprocating motion with the aid of an auxiliary motor coupled to the main one through a worm gear with the two pinions threaded in opposite direction. The hydraulic drive for a drill (USSR patent disclosure No 846801) controls the forward motion with the aid of a pump which drives two oppositely rotating motors coupled through a worm gear, a fluidic splitter ensuring proper ratio of their speeds and synchronism of both causing the drill to remain in position. Here the control is automated by means of feedback from a velocity transducer through an amplifier and a comparator to a servomotor driving the fluidic splitter, the comparator being programmed externally. Author

N85-24054# Joint Publications Research Service, Arlington, Va.
CONSERVATION OF TURBINES BY INHIBITED AIR Abstract Only c37
Ye. Yu. Kostrikina, V. P. Persiantseva, O. V. Zamyatina, Ye. V. Kuznetsova, and N. K. Mikhaylov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 27 Transl. into ENGLISH from Energetik (Moscow), no. 9, Sep. 1983 p 9-10 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Conservation (mothballing) of turbines is presently performed either by blowing through hot air or by applying volatile corrosion inhibitors to the surfaces of the turbine. The method of conservation of turbines using volatile inhibitors was now modernized. An entire turbine which is to be put out of service for some time is broken down into several sections and corrosion inhibitors are blown through each section in sequence. This allows better coating of the entire metal surface. The process also requires degreasing of wash water during demothballing. In a further development of the method, inhibited air is used for conservation. The distinguishing feature of this method is the use of acclosed system eliminating the possibility of leakage of inhibitors into the surrounding environment and thus virtually eliminating losses. The inhibitor used is a compound which has high protective effect for ferrous and nonferrous metals. Bringing the turbine back into service requires only that it be blown out with air, absorbing the inhibitor residue with silica gel. Author

N85-24055# Joint Publications Research Service, Arlington, Va.
HIGH RELIABILITY MECHANICAL-HYDRAULIC CONVERTER Abstract Only c37
V. N. Veller and V. S. Litvinov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 28 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 7, Jul. 1983 p 15-16 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The F. E. Dzerzhinskiy Institute of Technology has developed a mechanical-hydraulic converter, the reliability of which is determined by the complete absence of friction couples and the balance of hydraulic forces. The device is diagrammed and described. Results of testing of an experimental model at the Institute are presented. A graph illustrates the variation in influence of change in initial pressure on position of moving portion. Author

N85-24056# Joint Publications Research Service, Arlington, Va.
INVARIANT SYSTEM OF TECHNOLOGICAL PREPARATION OF

PRODUCTION Abstract Only
L. I. Zaltsman, R. A. Kyuttner, and B. I. Roginskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 29 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 32-34 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An integrated system was developed and is now gradually being introduced, consisting of two great segments: systems support and functional subsystems. The systems support segment includes the metamonitor system, data base and general applications programs; functional subsystems include the information retrieval, blank planning, technological process planning, control program development and equipment design sections. A structural diagram of the integrated system for preparation of production is presented. The metamonitor system is said to have several advantages over standard operating systems: reduction in labor consumption by a factor of 10 to 20, dynamic distribution of RAM for programs and data structures, utilization of dynamic files with up to 8 levels of subfile structures and modeling of virtual memory, utilization of associative data structures, timely introduction of alterations and additions to the subsystem, performance of jobs in stages utilizing memory equal to the maximum length of memory for a single instruction, possibility of dynamic attachment and detachment of terminals. The data base is briefly described.
Author

N85-24057# Joint Publications Research Service, Arlington, Va.
MECHANIZATION AND AUTOMATION OF PRODUCTION PROCESSES IN TURBINE BUILDING Abstract Only
V. P. Slobodyanyuk *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 29-30 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 22-24 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Specialists at the All-Union Institute of Planning and Technology of Energy Machine Building are working on the problem of mechanization and automation of production processes. One of the major technological processes being worked on is the production of welded units. At the present time the Institute has designed a centralized cutting and manufacturing shop in use at several metallurgical plants, clamping devices for materials hoists based on permanent magnets, a program controlled installation for driving shaped apertures in welded diaphragm rims and an automated system for planning technological processes involved in manufacturing operations. Even in the manufacture of such individualized devices as turbines, mechanization and automation of production processes are economically justified. During the 11th Five Year Plan, the Institute will continue to develop progressive technological processes and equipment for precise shaping of turbine blade blanks, mechanical working of parts of steam, gas and hydraulic turbines, as well as nuclear powerplant turbines.
Author

N85-24058# Joint Publications Research Service, Arlington, Va.
MANUFACTURE OF DRIVE WHEEL VANES FOR HYDRAULIC TURBINES ON PROGRAM CONTROLLED MACHINE TOOLS Abstract Only c37
S. M. Smirnov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 30 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 20-22 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Previously in manufacturing the vanes for model drive wheels, copying milling machines were used. With a new technology now in use, model 6R13F3 machines with model N-33-1M numerical program control units are used. This has required the development of a software system based on methods and algorithms of approximating curves and surfaces with spline functions. An AKI translator is used to develop the control programs and new modules. The technology of working of vanes from rectangular bars worked on 6 sides and having two vertical apertures to provide a base is briefly described. Models of vanes and drive wheels type RO-833 and RO-810 have been manufactured by the new process. The surfaces of vane models for the RO-833 wheel to be used at the Sayano-Shushenskaya hydroelectric powerplant are illustrated. Introduction of the new technology involving program controlled machines are increased quality and uniformity of vane surfaces while improving hydraulic characteristics of the drive wheels and the turbine as a whole.
Author

N85-24059# Joint Publications Research Service, Arlington, Va.
USE OF PROGRAM CONTROLLED MACHINE TOOLS TO AUTOMATE AND MECHANIZE PRODUCTION PROCESSES IN PIPE MANUFACTURE Abstract Only c37
A. P. Ogurtsov and S. B. Skvortsov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 31 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 17-20 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The Leningrad Metallurgical Plant is a pioneer in development of modern equipment. Program controlled machine tools were in use here since 1971, with more than 150 such units now in operation. Economic results of introduction of several of these machines are described. However, the rate of introduction of program controlled machines is frequently slowed down due to the great amount of labor required to prepare the control programs for processing of complex parts. Computer systems such as the PDP-11/05 acquired by the plant are used in development of the programs. This machine was used to develop a software system applicable for many types of domestic and imported program controlled machines. During the present 5 year plan, the plant is to introduce new methods of processing and progressive technological equipment, including equipment for mechanization of labor consuming processes, allowing automation of the working of most of the major types of parts and units of turbines.
Author

N85-24060# Joint Publications Research Service, Arlington, Va.
HYDRAULIC CHARACTERISTICS OF REDUCTION INSTALLATION VALVES Abstract Only c37
A. V. Surnov, L. V. Nikitina, Yu. A. Sitnyakovskiy, and L. G. Ten *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 31 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 14-16 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A wind tunnel was created at the Chekhov Power Machine Building Plant. Air is fed into the 250 mm diameter wind tunnel by a 2 stage compressor with a capacity of 41 cu m/min (s.t.p.) with a head of 11.8 kPa. The test stand was used to test full scale models of reduction valves. Five types of valves for maximum saturated steam flow rates of 45 to 160 t/hr, pressure 4.5 to 5.4 MPa, were tested. The test data were found sufficient for reliable profiling of the throughput cross sections of reduction valves.
Author

N85-24061# Joint Publications Research Service, Arlington, Va.
GROUP TECHNOLOGY FOR WORKING TURBINE DRIVE WHEEL DISKS Abstract Only c37
V. K. Glukhikh, S. B. Skvortsov, V. A. Sidorov, and N. V. Kokarev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 32 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 3, Mar. 1983 p 26-28 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The shortcomings of the existing technological process of manufacturing disks to be used as the hubs of low pressure steam turbines include the use of inaccurate equipment, low speed processing modes, high labor consumption, significant heating of parts and the impossibility of precise working for this reason. In developing a group technological process, mechanical working of the disk was divided into two main groups, differing in the method of attachment of the blades to the rim. Disks are worked using a program controlled model DFM-30 NCC-2200/1000 lathe, cooled with a large quantity of cutting fluid with chips removed by a chip transporter. Designs of disks were standardized and the design of

individual elements simplified. Progressive cutting tools with hard alloy plates were used. Productivity of labor was increased by 30 to 50%, consumption of specialized cutting and measurement tools reduced and less skilled workers would be used in the process. Significant savings of time can be achieved only by working 4 to 5 disks in a batch. Author

N85-24062# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF OPTIMAL CONTROLS FOR REAL-TIME LINEAR DIGITAL SYSTEMS Abstract Only
A. N. Gerasimov and V. M. Ivanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 32 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 32-36 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The solution of the problem of optimizing linear digital systems which are optimal in terms of sum of squares performance criteria leads to Riccati's difference equation. The problem of the analytical construction of controls which are optimum with respect to the generalized work criterion, consisting of solving a linear difference equation in reverse time, has been solved for the class of digital systems. An algorithm with a prediction model based on this criterion which allows controls to be synthesized in real time is proposed. Author

N85-24063# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF HIGH SPEED GUARANTEED REGULATORS Abstract Only **c37**
A. A. Kolesnikov and P. I. Chernysh *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 33 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 36-41 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The construction of guaranteed control systems for objects with variable parameters operating with incomplete information about parameters and perturbations is an important problem in optimal control theory. A procedure for synthesizing such systems for certain objects was examined. The problem of guaranteed control with respect to the synthesis of high speed regulators was specified; formulas were derived which can be used to identify a stationary object which is characterized by the poorest performance indicators in terms of speed. The procedure of constructing a high speed guaranteed regulator for an object thus consists of defining the analytical parameters and perturbations by the method explained in the study, and then synthesizing a control principle which is optimal in terms of speed in accordance with methods developed elsewhere. The true speed of the system for parameters and perturbations other than those calculated will be higher than for movement along a synthetic hypersurface, which gives rise to movement in the slipping mode. The method provides the best transient processes in terms of speed and invariance to changes in the parameters and perturbations. Author

N85-24064# Joint Publications Research Service, Arlington, Va.
MODAL SYNTHESIS OF MULTIDIMENSIONAL PI-REGULATORS FOR OBJECTS WITH INERTIAL SECTIONS Abstract Only **c38**
A. A. Voyevoda and S. A. Stavropoltsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 33-34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 42-46 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The synthesis of regulators for objects, which are described by matrix transfer functions with inertial sections, or which can be approximated accurately enough by such matrices were studied. These objects include flight vehicles, technological processes, motors, etc. The problem of choosing the parameters of a multidimensional PI regulator such that the poles of the system consisting of the regulator and the object are in the required region is studied. The example of synthesizing a PI regulator with y vector feedback for an aircraft turbine is provided. Author

N85-24065# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AXIAL SHAFT LOAD ON OPERATION OF MAGNETOELASTIC TORQUE TRANSDUCER Abstract Only **c35**
S. D. Levintov and A. G. Kostylev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 27-31 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Additional transducer errors occur when axial stress is applied to the shaft of a magnetoelastic torque transducer in addition to the stress which is being measured. An analysis of that additional error was conducted. Experiments used to conform this phenomenon are described. Author

N85-24066# Joint Publications Research Service, Arlington, Va.
THERMAL STATE OF COOLED THIN-WALLED NOZZLE BLADE Abstract Only **c37**
L. V. Arsenyev, I. B. Mitryayev, D. Yu. Pavlov, V. G. Polishchuk, and Yu. S. Osherov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 35 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Energet. (Minsk), no. 10, Oct. 1983 p 105-107 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An experimental study of thin nozzle blades with transverse cooling in gs turbines was made, for the purpose of obtaining data on their thermal state under various operating conditions. Tests were performed with a model blade of 1.2 mm wall thickness and 105 mm chord width, and with four prototype blades placed next to one another with a relative spacing pitch of 0.649 between two side baffles so as to form five passageways. Tests were one with a combustion chamber with air fuel mixing and an air compressor supplying coolant for injection through 6x0.6 mm slots in the blades within their concave part near the exit. The parameters of the propellant gas (combustion products) and of the coolant air were measured, also the temperature of the blade walls with a set of 10 micro-thermocouples. The data have been evaluated so as to reveal the temperature distributions over a blade wall and the mean cooling efficiency, the latter correlated with the degree of temperature nonuniformity along a blade. The results indicate that thin blades have better thermal characteristics and are better cooled than thick blades under the same conditions. Author

N85-24067# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF COMBINED CONVECTIVE AND FILM COOLING OF PERFORATED BAFFLE BLADES IN GAS TURBINES Abstract Only **c37**
Ye. N. Bogomolov and V. I. Orlova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 36 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Energet. (Minsk), no. 10, Oct. 1983 p 90-96 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Combination convective and film cooling of baffle blades with several rows of performance in gas turbines is evaluated on the basis of the thermal efficiency of each mode individually and the Kutateladze-Leont'yev relation for the efficiency of a gas shield before an array of perforations. The resultant film effect on a perforated surface is calculated according to the Sellers relation and, for calculating the heat transfer by internal convection, the thermal resistance of the blade wall is assumed to be negligible. The differential equation of coolant flow with continuous transverse jet injection is solved by the numerical method of finite elements. The results indicate ways to optimize the cooling system parameters for given operating conditions. Author

N85-24068# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF HEAT TRANSFER FROM SHAFT

IN COOLED RADIAL BEARING OF GNT-25 GAS TURBINE Abstract Only c34

V. V. Rukhlinskiy, I. D. Usayev, and A. V. Yermolenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 36-37 Transl. into ENGLISH from Teploenerg. (Moscow), no. 4, Apr. 1983 p 64-66 (For primary document see N85-24034 14-31)

Avail: NTIS HC A06

The heat transfer from the shaft in a cooled radial bearing design was studied experimentally in a GTN-25 gas turbine. The basic dimensions of the bearing were 315 mm inside diameter and 140 mm width. This split bearing had two oil feed orifices in the plane of separation and its housing was cooled with oil fed through an annular chamber. Heating of the shaft neck and the bearing housing under operating conditions was simulated. The experimental data have been processed according to methods of similarity and dimensional analysis, the results yielding semiempirical relations for the temperature and the thermal flux at the rubbing surface during laminar and transitional flow. Relations have also been obtained from these data for the hot spot temperature and the friction coefficient at the rubbing surface. The former characterizes the cooling system design and performance, the latter characterizes the bearing efficiency and economy. The results confirm that the effect of energy dissipation in the lubricant on the intensity of heat transfer from the shaft depends largely on the size and the shape of the shaft bearing clearance. G.L.C.

N85-24069# Joint Publications Research Service, Arlington, Va.
SELECTION OF BEARING TYPE FOR LARGE STEAM TURBINES Abstract Only c37

V. I. Olimpiyev, L. P. Safonov, L. D. Frenkel, and I. S. Yurchenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 37 Transl. into ENGLISH from Teploenerg. (Moscow), no. 4, Apr. 1983 p 28-32 (For primary document see N85-24034 14-31)

Avail: NTIS HC A06

The problem of bearing selection for large high speed steam turbines with flexible shaft was analyzed from the standpoint of performance and reliability assurance. The main criteria were hydrodynamic stability of the lubricant, balance of masses, and adequate damping, necessary for avoiding or suppressing vibrations. Elliptical bearings with boost lubrication and four shoe or three shoe segmental bearings are evaluated comparatively on the basis of theoretical considerations and experimental data. It was established that the performance can be optimized, in terms of minimum power losses and maximum lubricant economy, by feeding the lubricant directly to and from the supporting film, by feeding the lubricant not by shaft rotation but through a slot in the upper half, and by eliminating lubricant flow into idle spaces. Segmental bearings were found not to offer any advantages in this respect, elliptical bearings having better damping characteristics and thus being most suitable for long continuous operation.

Author

N85-24070# Joint Publications Research Service, Arlington, Va.
ESTIMATING DEFECTIVENESS BUILDUP DURING SERVICE IN METAL OF WELDED RUNNER IN LOW-PRESSURE CYLINDER OF TURBINE Abstract Only c37

A. Sh. Leyzerovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 38 Transl. into ENGLISH from Teploenerg. (Moscow), no. 10, Oct. 1983 p 42-47 (For primary document see N85-24034 14-31)

Avail: NTIS HC A06

Runners in the low pressure cylinders of K-160-130 steam turbines are of the welded construction and, therefore, must be carefully monitored for defectiveness buildup during operation. Since conventional flaw detection is not practical here, an experimental theoretical program was developed for this purpose. The state of thermal stress of these runners is characterized and determined principally by the temperature difference along the radius of the diaphragm seal in the second stage, approximately proportional to the starting tensile thermal stress along the shaft in the first stage. The problem of estimating the thermally stressed state is solved by the temperature field plotting method and with the aid of temperature difference nomograms for startup after down time of various lengths. Calculations for 34KhMA steel reveal the conditions for brittle fracture and indicate ways to avoid them. Preheating the runner seals with steam under some devacuumization for 2 hours before soft (with respect to temperature rise) startup is recommended as the most effective countermeasure.

G.L.C.

N85-24071# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN IMPROVING RELIABILITY AND ACCURACY OF REGULATORS WITH HYDRAULIC AMPLIFIERS IN MAIN CHANNEL OF POWER TURBINE Abstract Only c37

V. A. Ivanov, V. A. Pakhomov, and L. I. Chernyavskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 38-39 Transl. into ENGLISH from Teploenerg. (Moscow), no. 10, Oct. 1983 p 38-42 (For primary document see N85-24034 14-31)

Avail: NTIS HC A06

Pressure fluctuation is the main problem in operation of hydraulic amplifiers with slide valves in the main channel of a steam power turbine, these amplifiers being part of the automatic turbine regulator system and being controlled by flow in the main turbine channel. Experimental studies and theoretical analysis have revealed that the three main sources of pressure fluctuation are: (1) fluctuation of the steam behind the inlet diaphragm causing pressure fluctuation with small uniform amplitude along the channel; (2) expansion of the jet behind the inlet diaphragm causing pressure fluctuation with maximum amplitude at some distance along the channel; and (3) nonsteady discharge through inlet and outlet diaphragms causing pressure fluctuation with large uniform amplitude along the channel. The performance and the design of slide valves for these hydraulic amplifiers have been evaluated. Insertion of a straightening mesh between throttle inlet orifices and working surface of the slide valve will reduce the amplitude of pressure fluctuation and thus also the amplitude of slider vibration, a possible cause of regulator jitter.

Author

N85-24072# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF SYMMETRIC RHOMBIC DRIVE MECHANISM FOR SINGLE-CYLINDER STIRLING ENGINE Abstract Only c37

B. Orunov, V. S. Trukhov, and I. A. Tursunbayev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 39 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 29-33 (For primary document see N85-24034 14-31)

Avail: NTIS HC A06

A symmetric rhombic drive mechanism is used for Beta modification Stirling engines in high efficiency small autonomous power plants. The phase shift between displacing piston and working piston depends largely on the design of the drive components and does largely affect the engine performance in terms of pressure variations during the cycle. A method of calculating the parameters of such a drive was developed on the basis of the Schmidt model, assuming an ideal gas as the working substance, a 100% efficient regenerator, and isothermal compression and expansion in the hot zone and in the cold zone, without hydraulic power losses in the heat exchanger ducts, leakage or spillage of the working substance. One basic design parameter is the length of the connecting rod. Here calculations are shown for this length as function of the eccentricity and of a power parameter, also for the optimum (with respect to the power parameter) length as function of the eccentricity and of the temperature ratio. It is similarly possible to determine the displacement volume, the piston travel, and the cylinder diameter for required engine performance.

Author

N85-24073# Joint Publications Research Service, Arlington, Va.
DESIGN OF PIPING FOR OIL DRAIN FROM TURBINE BEARINGS Abstract Only c37

I. Ya. Tokar, Ye. I. Zaretskiy, I. I. Melnikov, and S. M. Polishchuk *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 40-41 Transl. into ENGLISH from Energomashinost-

royeniye (Moscow), no. 6, Jun. 1983 p 15-17 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The performance of the piping system for oil drain from turbine bearings is analyzed on the basis of the two dimensional Laplace equation for flow of a viscous incompressible fluid through a rectangular channel and the Poisson equation for flow of such a fluid into the collector pan. The flow is assumed to be two dimensional and laminar, stable throughout its path, with negligible inertia forces and negligible pressure variations at the oil air interface. The solution to this system of equations for the appropriate boundary conditions and experimental data on the oil level along a model drain channel are correlated with the Chezy equation, its coefficient being most accurately (within 30%) described by the A.D. Al'tshul' relation c=2.66Re to the 0.47th power. An empirical design equation is subsequently derived for the discharge coefficient as function of the Reynolds number in the Mu (N sub r) = a-bRe + c(Re) squared-d(Re) cubed form which approximates the results of measurements within 5% accuracy. Author

N85-24074# Joint Publications Research Service, Arlington, Va.
STABILITY OF TURBINE RUNNERS IN SLIDING BEARINGS UNDER EXTERNAL CIRCULATION FORCES Abstract Only **c37**
V. A. Agafonov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 41 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 6, Jun. 1983 p 13-15 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The dynamic stability of turbine runners in sliding bearings was analyzed, taking into account not only the action of hydrodynamic forces in the lubricant film and gas-dynamic forces produced by nonuniform spillage of steam from the high-pressure stage but also the effects of lower runner stiffness, higher steam rate, higher initial steam temperature and pressure, and higher sliding velocity in bearings in turbine sets of higher power ratings. Numerical results obtained on a computer for two types of cylindrical bearings, conventional ones and special ones having a bore surface asymmetric with respect to the shaft axis, reveal the circulation forces alone are necessary but not sufficient for self-excitation of runner vibrations. This can occur only when the work of nonconservative circulation forces exceeds the work of dissipative forces, which is likely to happen as the circulation forces increase proportionally to the shaft deflection with increasing runner speed. The results reveal also a continuous shifting of the stability limit and indicate the acceptable range of critical design parameters. G.L.C.

N85-24075# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF PROFILES OF INTERMEDIATE BLADE SECTIONS FROM MASTER PROFILES GIVEN ON CONICAL SURFACES Abstract Only **c37**
M. P. Kaplan and N. N. Kovalenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 42 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 6-7 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An expedient way to produce highly economical turbine stages with wide opening angles is to design them with conical surfaces bounding the flow channel. A method is proposed for drawing the profiles of intermediate blade sections on a blueprint from master profiles given on conical surfaces approximating the surfaces of meridional traces of stream lines, after these surfaces have been developed onto a plane. The algorithm of this construction was programmed for an M-222 digital computer. High design precision requires at least 50 points each on the convex part and on the concave part of the blade contour, and an array of section profiles so dense that the distance between adjacent sections to be drawn does not exceed 30 to 40% of the chord length. Author

N85-24076# Joint Publications Research Service, Arlington, Va.
CAUSES AND MEANS OF PREVENTION OF EROSION OF EXIT EDGES OF DRIVE VANES IN FINAL STAGES OF K-300-240 TURBINE Abstract Only
V. G. Orlik and L. B. Reznik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 42-43 Transl. into ENGLISH from Energetik (Moscow), no. 9, Oct. 1983 p 8-9 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A method, instruments and devices were developed and model and field studies were performed of the flow of steam and moisture downstream from the last stage of a K-300-240 turbine in the vicinity of the vertical separating rib. The quantity of moisture flowing toward the drive wheel of the last stage over the inner cone of the exhaust tube was measured, and found to decrease with increasing temperature, disappearing at 140 C. When the turbine is loaded, moisture appears on the cone at approximately 60 MW, reaching 60 kg/hr at nominal mode and increasing with decreasing steam superheating temperature, to 80 kg/hr at 60 MW and 365 C. The steam receiving section of the condenser was found to be overloaded since the cross section of its drains was not designed to receive steam with excess moisture content. Excessive twisting of the steam flow beyond the last stage in the direction of rotation was experimentally determined. The quantity of erosion-dangerous moisture downstream from the last stage depends on the temperature difference between turbine exhaust and the machine room in which it is located. Author

N85-24077# Joint Publications Research Service, Arlington, Va.
OSCILLATIONS OF GAS TURBINE INSTALLATION ROTORS UNDER OPERATING CONDITIONS Abstract Only **c37**
Ye. A. Igumentsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 43 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 7, Jul. 1983 p 7-10 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Experimental studies to determine the frequencies and amplitudes of oscillations of rotor bodies when oil vortexes are present indicated that the frequency of the vortex may differ significantly from half the rotating frequency of the rotor, the amplitude exceeding the levels of oscillations at the nominal rotor speed by many times. Problems of rotor-bearing-body dynamics under operating conditions are thus extremely important. A gas turbine rotor can be looked upon as an elastic beam in compliant supports. A mathematical analysis of the problem is presented. The algorithm used allows the vibration status of a gas turbine to be computed under operating conditions for a GT-750-6 turbine, used in major compressor stations along main gas pipelines. Author

N85-24078# Joint Publications Research Service, Arlington, Va.
STUDY OF DYNAMIC CHARACTERISTICS OF PREFABRICATED GAS TURBINE COMPRESSOR ROTOR Abstract Only **c37**
I. I. Oriov, A. T. Kensorinova, and A. D. Tsigelnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 43-44 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 7, Jul. 1983 p 3-7 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Results are presented from studies of a prefabricated high-speed turbine compressor rotor designed to operate at 6100 to 7100 rpm. The rotor consists of two parts bolted together: a one piece forged turbine and cast compressor sections. Experimental studies were performed on a large scale model of the rotor planned on the basis of the theory of approximate modeling of rotor dynamics. The model rotor was manufactured at the turbomotor plant with eight circular slots distributed over the length of the rotor for balancing purposes. The method of calculation of forced oscillations of rotors considering the dynamic properties of the lubricating layer and bearings was found to allow the standards for permissible residual imbalance of the rotor to be determined in the planning stage. The dynamic properties of the rotor bearings are very significant in determining the desirability of using various types of bearing supports for rotor operating at 6500 to 8500 rpm. Author

N85-24079# Joint Publications Research Service, Arlington, Va.
DESIGN OF SINGLE-WHEEL GYROCOMPASS WITH CORRECTION Abstract Only c35
L. M. Ryzhkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 45 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 5, May 1983 p 50-53 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The feasibility of reducing the intercardinal deviation as well as other dynamic errors of a single-wheel gyrocompass with correction is examined, considering that the time constant of the horizontal indicator must not be long in the case of high-frequency azimuthal oscillations. A system of four differential equations of motion with two correcting torques and two time constants is written for a gyrocompass mounted on a rocking base. This system in angular variables is transformed into one in deviations of the angular variables from their values in the position of static equilibrium. The first approximation of this system yields a simple characteristic equation, its second approximation yields a simple expression for the intercardinal deviation. An analysis of the solution and its stability reveals that the time delay in the horizontal indicator can be shortened while a time delay is introduced into the corrective network. A further advantage is that, unlike the time constant of the horizontal indicator, the time constant of the torque correction can be varied during operation of the gyrocompass. Author

N85-24080# Joint Publications Research Service, Arlington, Va.
TWO-STAGE GYROCOMPASS Abstract Only c04
S. A. Shestov *In its* USSR Rept.: Eng. and Equipment 9 Feb. 1984 p 45-46 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 5, May 1983 p 45-50 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A two-stage gyrocompass was developed which includes a tachometer with electrical feedback on the platform with the shaft in either vertical or horizontal position. The tachometer is driven by a gear motor which can be made to be self-braking. The tachometer output signal is first stored in a capacitor which it charges, then retrieved through discharge of the capacitor and amplified for homing the platform into the meridional plane. A pause is provided in the operating cycle of the capacitor switch, to allow transients in the tachometer to decay between tachometer signal reading and subsequent platform homing. Separation of the two processes in time by way of cyclic operation with the use of a capacitor makes it possible to pin the instant of time at which the platform reaches the meridional plane, and facilitates extraction of the useful tachometer signal from random interference signals. A performance analysis and evaluation of the static error in the geographic system of coordinates, assuming that the platform is pivoted to a base stationary relative to the Earth except for random shaking, reveals that such a gyrocompass has no systematic error and is at least as accurate as one with continuous platform homing. Author

N85-24081# Joint Publications Research Service, Arlington, Va.
FLIGHT SIMULATION FOR INERTIAL NAVIGATION SYSTEM Abstract Only c04
V. V. Aleksandrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 46 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat. Mekhan. (Moscow), no. 4, Jul. - Aug. 1983 p 95-99 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An inertial navigation system consisting of two accelerometers is considered for flight simulation tests. The accelerometers are mounted on a leveled and gyroscopically stabilized platform absolutely free to move along the azimuthal coordinate. The aircraft with a digital computer on board is assumed to move on a sphere concentric with the Earth. The control law in matrix form is derived from the equations describing ideal performance of this navigation and to be simulated on the aircraft computer. The inertial force acting on the masses of accelerometer sensors is simulated with the force of gravity and the dynamic simulation of aircraft flight is aided by another digital computer controlling the test stand. On this basis is then established the feasibility of simulating nonideal performance of the navigation system during perturbations, also the feasibility of flight simulation for a navigation system consisting of three accelerometers and corresponding operating with six signals: three accelerometer readings and three angles defining the aircraft orientation. Author

N85-24082# Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMUM CORRECTIONS TORQUE FOR VERTICAL GYRO ACCORDING TO SPECIAL-PURPOSE PROGRAM Abstract Only c35
A. A. Kubenskiy, M. A. Sergeyev, and V. A. Yablonskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 47 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 50-53 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Three models of correction are considered for a vertical gyro. Optimization of the correcting torque in each mode involves linearization of the problem and then finding the slope of the torque-angle characteristic which will yield the minimum mean-square error. The algorithm and calculations were programmed in FORTRAN. Author

N85-24083# Joint Publications Research Service, Arlington, Va.
PRECISE MOUNTING OF INSTRUMENTS IN UNIVERSAL SUSPENSION WITH SKEWED AXES Abstract Only c35
N. F. Perkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 47-48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 47-50 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The problem of resolving the vector of finite rotation into three components along three mutually nonorthogonal axes is solved with the aid of 4x4 quaternion matrices of Rodrigues-Hamilton parameters. The exact solution to this problem is applicable to such practical precision problems as homing an antenna to a target, mounting an instrument on a movable platform, and determining the orientation of an object from readings of a gyroscope set with imprecise initial reading or with skewed gimbals. Author

N85-24084# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF HYPERSTABLE CONTROL SYSTEM WITH ADAPTIVE MODEL Abstract Only c35
G. S. Chkhartishvili and V. B. Berezin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 30-33 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Adaptive systems for control of continuous dynamic objects can be synthesized by using the inverse of the object as model and connecting it in series with the object. The parameters of this model can be tuned adaptively according to the hyperstability criterion. The algorithm of adaptation is constructed for a linear dynamic object with one input and one output. Digital simulation of such an adaptive control system is demonstrated on a typical second-order object (p squared + 1.5p + 2.5)x(t) = (p + 2y(t). The method is also applicable to adaptive control of nonsteady and nonlinear objects. Author

N85-24085# Joint Publications Research Service, Arlington, Va.
POSITIONING ERRORS OF COMMUTATING LENSES AND THEIR INFLUENCE ON CHARACTERISTICS OF HIGH SPEED MOVIE CAMERAS c35
A. V. Nikulin, S. G. Okishev, and A. A. Tsukanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 49-56 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 25, no. 7, Jul. 1983 p 83-89

(For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Positioning errors of commutating lenses in high speed movie cameras with optical-mechanical image switching are examined. The influence of these errors on the frame exposure rate, the lens speed and other movie camera characteristics is demonstrated. Author

N85-24086# Joint Publications Research Service, Arlington, Va.
OPTOACOUSTIC RECEIVER WITH SEMICONDUCTOR-TYPE RADIATOR AND PHOTODETECTOR Abstract Only **c74**
V. P. Kolonistov and M. V. Robachevskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 57 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 56 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Conventional optical microphones in OAP-5M optoacoustic receivers use an incandescent lamp as light source and a silicon photodiode as detector. The authors propose to replace the incandescent lamp with an AL-107B GaAs light-emitting diode, its emission line matching the spectral sensitivity of an FD-7K photodiode. This light-emitting diode has a life of 10,000 h, much longer than that of an incandescent lamp, but the intensity of light emitted by it also fluctuates much more. The spectral distribution of these fluctuations is that of flicker noise (1/f). On the basis of comparative signal and noise measurements using the microphone with an incandescent lamp or with a light-emitting diode, also with an overheated light-emitting diode, the microphone sensitivity was adjusted for proper operation with a light-emitting diode without change in the noise-equivalent power. Overheating of the light-emitting diode, which raises the noise level, can be avoided by mounting it on a heat sink and carefully soldering its electrical leads during assembly of the microphone. Author

N85-24087# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF SENSITIVITY OF SHADOWGRAPHIC INSTRUMENTS WITH SPHERICAL AUTOCOLLIMATING MIRROR Abstract Only **c74**
A. S. Avramenko, E. Yu. Durovich, and B. V. Naumov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 57-58 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 40-43 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

In shadowgraphic instruments with a spherical autocollimating mirror, which acts as the main objective, the knife is usually placed near the center of the mirror curvature with the test specimen between knife and mirror surface. Proper use of these instruments requires that their performance parameters such as sensitivity range and sensitivity threshold be known. A sensitivity measurement method is proposed that eliminates deflection of the light beam on which other measurement techniques are based and replaces it with passage of a second light beam through a given point of the test specimen at an angle equal to the would-be deflection angle. The plane-parallel plate now produces a linear shift of diverging light rays equivalent to deflection through an angle proportional to the angle of incidence. The equipment for sensitivity measurement by this method includes an incandescent lamp as light source, a condensing lens, a light-sensitive diaphragm also acting as the knife, a projector objective, and a television camera with photosensitive film. Calculations for subsequent data processing are based on laws of geometric optics. Author

N85-24088# Joint Publications Research Service, Arlington, Va.
USE OF FOCONS IN COMBINATION WITH BRIGHTNESS AMPLIFIERS Abstract Only **c74**
S. P. Bondarev and N. P. Kupreychik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 58-59 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 59 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The feasibility of combining conical fiber optics as light guide with image converters as amplifiers is examined from both theoretical and practical standpoints. In an experiment the focon was placed in inverse position, namely with the narrow end behind the objective projecting an object illuminated through a condenser and with the wide end before the converter window. In such an arrangement the image converter operates in a more favorable mode in terms of image transmission characteristics but with loss of brightness. The tradeoff between improving the image transmission characteristics and worsening the energy characteristics was optimized by selecting a focon with the best ratio of entrance diameter to exit diameter. A focon 65 mm long of a material with a refractive index n = 1.51, entrance aperture 0.58, entrance diameter 8 microns, exit aperture 0.19, was joined to the input window of an image converter through a 0.3 mm thick immersion layer. With electron-optical gain of 0.7 and 25/mm resolution of the image converter, the system transmitted an optical image with a space frequency of 42/mm and 30% modulation ensuring brightness gain (ratio of image brightness to object brightness) of 20. Author

N85-24089# Joint Publications Research Service, Arlington, Va.
MULTILAYER REFLECTING SYSTEMS BASED ON GLASSY CHALCOGENIDES FOR INFRARED LASERS Abstract Only **c36**
Yu. Yu. Firtsak, N. I. Dovgoshey, V. F. Sharkov, T. N. Kurochkina, A. A. Tarnay, and I. I. Muchichka *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 59-60 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 48-52 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Materials of the Ge-As(Sb)-S(Se) system have properties which make them eminently suitable as basis of interference-type reflective coatings on mirrors of infrared power lasers. In addition to having a low absorption coefficient and wide transparency window combined with high radiation resistance, they are insoluble in water and thermally stable. They also have high mechanical strength and high resistance to cracking in a humid atmosphere, their refractive indices differing sufficiently for effective color separation by a multiheterolayer coating. The proper technology and the attainable performance characteristics of interference-type coatings consisting of glassy Ge-As-S, Ge-As-Se, Ge-Sb-Se layers were established in feasibility studies, continuous and uniform thin layers with specular surfaces having been produced from the raw materials by condensing them on cold substrates. The vacuum-evaporation process yielded films of 100 to 300 A thickness with an absorption coefficient of the order of 0.1/cm at the 10.6 micron wavelength and with a microhardness within the 230 to 450 kgf/sq m range, their crystallization and breakdown temperatures within 330 to 480 C and 450 to 500 C respectively. Author

N85-24090# Joint Publications Research Service, Arlington, Va.
DETERMINING OPTIMUM SERVICE CONDITIONS FOR CONCENTRATOR MIRRORS BY METHODS OF MATHEMATICALLY PLANNED EXPERIMENT Abstract Only **c74**
A. Ismanzhanov, Ts. M. Altman, R. A. Zakhidov, and L. A. Dubrovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 60 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1984 p 45-49 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A method of mathematically planning an experiment was proposed for determining the optimum service conditions for concentrator mirrors and also obtaining data on mirror performance which can be useful for optimization of the mirror manufacturing technology. First are determined the number of factors influencing a mirror under service conditions and the ranges of their likely variation. Then, by an a priori ranking process and on the basis of preliminary analysis, these factors are classified into significant and insignificant ones in terms of their contribution to the aging process. The method was applied to aluminum mirrors with front side reflection and various protective coatings. The plan of a 4 factor (air humidity, abrasive wear by dust and sand, photochemical action of solar radiation, mechanical action of cleaning agent) 3 level (base, upper, lower) experiment is shown and the regression

equation is obtained for a typical case. Recommendations on optimum mirror design and selection are made on the basis of this experiment. G.L.C.

N85-24091# Joint Publications Research Service, Arlington, Va.
SOLAR CELLS BASED ON POLYCRYSTALLINE SILICON WITH ISOTHERMAL POTENTIAL BARRIERS ALONG GRAIN BOUNDARIES Abstract Only **c44**
S. A. Azimov, F. A. Akhmedov, T. M. Kasymova, Z. Mirsaidova, and R. A. Muminov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 61 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 13-16 Original language document was announced in IAA as A83-48398 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A technique for reducing the influence of interboundary states in polycrystalline silicon on the conversion efficiency of a solar cell is proposed which is based on the formation of isotypic potential barriers along the grain separation boundaries. It is shown that the isotypic potential barrier considerably reduces the effect of grain separation boundaries on the basic solar cell parameters and leads to an increase in the conversion efficiency of polycrystalline cells almost to values characteristic of single crystal cells. IAA (B.J.)

N85-24092# Joint Publications Research Service, Arlington, Va.
PHOTOVOLTAIC CELLS OF InP-CdS HETEROJUNCTION TYPE AND THEIR TEMPERATURE CHARACTERISTICS UNDER A-M ILLUMINATION Abstract Only **c44**
L. V. Gorchak, E. V. Gilan, V. G. Doroshenko, A. D. Kitoroaga, M. B. Kokhanyuk, Ye. V. Russu, and Ye. S. Khanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 61-62 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 10-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The temperature characteristics of photovoltaic cells on InP-CdS heterojunctions with p+-p-n+ structure were measured, for a comparative evaluation relative to conventional silicon cells with n+-p structure. Specimens were built on polished p-InP single crystals orientation as substrate wafers. Author

N85-24093# Joint Publications Research Service, Arlington, Va.
SOLAR CELLS WITH DISTRIBUTED PARAMETERS: CURRENT-VOLTAGE CHARACTERISTICS UNDER UNIFORM AND NON-UNIFORM ILLUMINATION Abstract Only **c44**
Kh. K. Aripov and V. D. Rumyantsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 62 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 6-10 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A simple method of calculating the current voltage characteristics of solar cells, based on an equivalent resistance diode ladder network with stripline contacts, is applied to such cells with uniform thickness and various shapes of the active surface. Distributed resistance are represented by equivalent lumped ones. This procedure is applied first to the case of uniform illumination, using measured current voltage characteristics of cells and very precisely piecewise linearly approximated exponential current voltage characteristics of diodes. In the case of nonuniform illumination the latter is assumed to be axisymmetric, with the surface consisting of completely dark and uniformly bright segments. Numerical data is generated on this basis for GaAs cells of rectangular or sectoral shape uniformly illuminated and in the shape of circular disks either completely uniformly illuminated or with various configurations of concentric dark and bright zones. Nonuniform illumination is found to result in a flatter current voltage characteristic with a lower open circuit voltage. Author

N85-24094# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF PARAMETERS OF SILICON PHOTOVOLTAIC CELLS ON TEMPERATURE AND LIGHT INTENSITY Abstract Only **c44**
S. N. Borisov, S. M. Gorodetskiy, G. M. Grigoryeva, K. N. Zvyagina, and A. M. Kasymakhunova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 63 Transl. into ENGLISH from Geliotekh. (Tashkent), no. 4, Apr. 1983 p 3-6 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Two translucent photovoltaic cells with n+-p-p+ structure and shallow embedded 0.4 to 0.5 micron thick n-p junction were studied. Data show current voltage characteristics at various temperatures and light intensities, and the temperature dependence of open circuit voltage, short circuit current, maximum power, optimum operating voltage and current, and maximum efficiency. The temperature dependence of all these parameters is linear or nearly linear over the given range; the current increases slightly, the voltage and the power and the efficiency decrease appreciably with rising temperature. The absence of power peaking in the low temperature range is noted. E.A.K.

N85-24095# Joint Publications Research Service, Arlington, Va.
LASER BEAM SHAPING SYSTEM WITH REDUCED OBJECTIVE DIAMETER Abstract Only **c36**
E. Ye. Skoblo, N. I. Kulikovskaya, I. O. Rybalko, and D. A. Ovchinnikova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 63-64 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 62 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The divergence of laser beams is usually decreased by beam shaping Galilean telescope optics, Keplerian telescope optics are not suitable for this purpose because of resulting excessively high energy concentrations. The use of a Galilean system alone requires an appreciable enlargement of the objective diameter. This enlargement can be reduced by a modification by insertion of a converging lens with a focal length of f (sub l) > d (sub l) l (sub gamma l) between the laser exit window and the ocular. The exact location of this lens is determined by the system geometry and dimensions and the maximum allowable energy concentration at optical surfaces, considering that the ocular diameter should be the smallest possible. The proposed method allows much design flexibility. E.A.K.

N85-24096# Joint Publications Research Service, Arlington, Va.
SPHERICITY GAUGE FOR WAVEFRONT OF LASER RADIATION Abstract Only **c36**
V. P. Andronov, Ye. I. Dmitriyev, and A. P. Shestakov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 64 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 58-59 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A wavefront sphericity gauge was developed, built, and tested for use in laser wavefront compensation systems. It detects and measures the longitudinal error of focusing by the lens in such a system due to deviation of the laser radiation wavefront from its required degree of sphericity. The algorithm of detection and measurement involves comparing the radiation intensities in two planes spaced symmetrically with respect to the focusing plane. This algorithm is executed by a radially slotted disk which has been split diametrically into two halves and the letter separated along the axis. The discrimination characteristic of this instrument deviates from a linear one slightly more than theoretically, because of higher order aberrations. B.W.

N85-24097# Joint Publications Research Service, Arlington, Va.
SCHEME FOR MEASURING SPECULAR REFLECTION COEFFICIENT AT 10.6 MICRONS WAVELENGTH WITH ZIGZAG-PATH CELL AND INTEGRATING SPHERE Abstract Only **c74**
T. A. Zhevlakova and S. S. Sementsov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 64-65 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 31-32 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Most accurate measurement of a specular reflection coefficient near unity with an error not larger than 0.1% is possible by the

method of multiple reflections along a cell formed by two mirrors. This method, which averages the reflection coefficient over the surface of the test mirror, can be improved by addition of an integrating sphere in the receiver channel. This principle has been applied to measurement of the specular reflection coefficient in the infrared range. An integrating sphere with sufficiently diffusing surface and nonselective reflectivity is made of pure aluminum, which also features high thermal conductivity and corrosion resistance. A continuous wave CO2 laser serves as radiation source, the radiation is modulated at a frequency of 21.5 Hz and the light beam passes through a diaphragm before entering a zigzag cell formed by two parallel mirrors: the test mirror and a reference mirror. The sphere carries a pyroelectric probe with amplifier in its window. One mirror and the sphere can be moved in a plane perpendicular to the light beam so that the latter will enter the sphere either after passing through the cell or directly.
B.W.

N85-24098# Joint Publications Research Service, Arlington, Va.
COLOR-SELECTIVE COATING FOR VIEWFINDER IN OPTICAL INSTRUMENTS Abstract Only **c74**
B. D. Gorelik, D. Ye. Yefremov, and A. P. Lavrishchev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 65-66 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 28-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A color selective coating for the viewfinder in optical instruments is described which maintains a neutral coloration of light at any reflection to transmission ratio within the desirable R:T = 1-1.35 range. The coating consists of two 3 layer stacks with a separating interlayer built up on a substrate. The interlayer facilitates interference so that light neutralization is ensured if within each of the seven principal wavelength (color) ranges. Maximum and minimum optical thickness of the interlayer are determined from the corresponding conditions of interference and known characteristics of the eye (color resolution 5 nm). Coatings comprising various combinations of MgF2, ZnS, ZrO2, TiO2, CeO, SiO2 layers were produced according to this principle, their spectral characteristics measured, and their performance tested in a mirror type camera.
Author

N85-24099# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF PROPERTIES OF OPTICAL CAVITY ON MISALIGNMENT Abstract Only **c74**
A. L. Levit and V. M. Ovchinnikov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 66 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 17-18 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The effect of misalignment in an optical cavity with plane mirrors and focusing lens on its properties is analyzed in the parallax approximation with the aid of (ab/cd) ray matrices, considering that the principle consequence of misalignment between the resonator components is a change in the length of its optical axis. The resultant ray matrix is obtained as the product of three 4x4 matrices multiplied in the reverse order in which a ray passes through these elements: matrix of translation through distance L (length of the optical axis), matrix of astigmatic lens with principal focal lengths f(x),f(y) and matrix of reflection by a plane mirror. This general method is applied, for illustration, to a ring cavity with an even number of mirrors and a planar axial contour. Author

N85-24100# Joint Publications Research Service, Arlington, Va.
ABERRATION CHARACTERISTICS OF PLANE-PARALLEL COMPENSATOR PLATE Abstract Only **c74**
I. E. Komarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 66-67 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 13-16 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A specially constructed plane parallel compensator plate in a ring telescope catodioptric objective does not affect the size of the dead zone in the pupil and will not only eliminate parasitic flare or bright spots but also allow the relative aperture of each mirror and of the entire objective to be substantially enlarged. Such a plate consists of two elements, the smaller one with a diameter equal to that of the secondary mirror placed at the center of the larger one so as to face that mirror. Here the aberration characteristics of this compensator are analyzed according to the laws of geometric optics for wide beams of light rays. Five different compensator configurations are conceived on this basis for complete correction of spherical aberration, with the appropriate formulas given for calculating the necessary plate thickness.
Author

N85-24101# Joint Publications Research Service, Arlington, Va.
ERROR OF DISTANCE MEASUREMENT BY PHASE-TYPE OPTICAL RANGE FINDERS WITH PHOTORECEIVERS OF VARIOUS TYPES Abstract Only **c74**
Yu. P. Yegorov and B. L. Pivovarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 67 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 3-4 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An optical range finder is considered which consists generally of a radiator, a modulator, a generator of modulating signals, a photoreceiver, a limiter and a phase detector. Assuming that the radiator operates in the continuous mode and that the radiator signal is modulated by a harmonic one, the effect of photoreceiver noise on the error of distance measurement is estimated for two types of photoreceiver: a photomultiplier and a photodiode. The spectral power density of the detector output signal is calculated which will result when an additive mixture of a harmonic modulating signal and photoreceiver noise appears at the detector input. The general expression for this spectral power density is then modified so as to account for the respective noise characteristics of the particular type of photoreceiver, the principal noise in a photomultiplier being flare caused by the incoming radiation signal and thermal noise in the load resistor being the principal noise in the case of a photodiode. The correctness of these relations was verified experimentally with an optical range finder built according to the general scheme but with a 32DL light emitting diode as radiator operating in the pulse mode. Author

N85-24102# Joint Publications Research Service, Arlington, Va.
ABATEMENT OF NOISE AND VIBRATION IN PIPELINES OF HYDRO SYSTEMS Abstract Only **c71**
R. A. Dashevskiy, Yu. P. Shchevyev, V. F. Rudenko, and V. V. Vechirko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 68 Transl. into ENGLISH from Energrt. i Elektr. (Kiev), no. 1, Jan. - Mar. 1983 p 19-21 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The mechanism of vibration and the acoustic field in a long water pipeline are analyzed in terms of interaction of forces, propagation of waves, and transfer of energy. Low frequency and high frequency vibration are examined from the standpoint of resulting noise and the possibility of its abatement. Analytical relations for the acoustic impedance of the pipe wall and the damping coefficient in the pipeline transporting a liquid indicate the characteristics of a wall coating necessary for sound proofing the pipeline. These relations can also be used for redesign of old and design of new low noise pipelines. Author

N85-24103# Joint Publications Research Service, Arlington, Va.
FLOW AROUND AXISYMMETRIC BODIES WITH UNIFORM-VELOCITY ZONES Abstract Only **c34**
L. A. Kozhuro *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 68-69 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk), no. 4, Jul. - Aug. 1983 p 63-67 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The appriori unknown shape of a thick axisymmetric body is determined from the streamlining pattern, on the assumption that such a body with a given volume has a small surface but also a

sufficiently high critical Mach number to make nonseparation flow along its surface realizable. The body is furthermore assumed to be symmetric with respect to the r = 0 plane as well as with respect to the x = 0 plane. The velocity is uniform v sub 1 along the front nose and the back nose and uniform v sub 2 along the main lateral segment, but not uniform along the spherical transition segments between the main lateral surface segment and the nose segments. The boundary between a spherical transition and the main lateral surface segment is determined from the condition of zero velocity gradient. The problem is solved by regarding the body surface as a vortical one with unknown vortex intensity. The solution is obtained by a numerical method, the equivalent of Ryabushinskiy's scheme for axisymmetric jet flow, using a cubic spline with respect to the axial coordinate and subsequent approximating iterations with respect to the radial coordinate for the main lateral segment. B.W.

N85-24104# Joint Publications Research Service, Arlington, Va.
SOME OPTIMIZATION PROBLEMS IN STATIC AEROELASTICITY FOR WINGS MADE OF COMPOSITE MATERIALS Abstract Only c05
N. V. Banichuk and S. Yu. Ivanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 69-70 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 3, Mar. 1983 p 21-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Two optimization problems are considered which arise in design and construction of straight wings with composite materials. The wing is to be made of an elastic isotropic composite material containing randomly oriented reinforcement fibers, the range of fiber concentration being limited by other considerations to 0 < or = zeta min < or = zeta (x) < or = zeta sub max < 1. The equation of aerodynamic equilibrium and the boundary conditions for an elastic wing in a gas stream are used as basis for establishing the optimality criterion and minimizing the weight functional, with the wing treated as a beam. The first problem is to minimize the weight through optimum distribution zeta (x) of reinforcing fibers over the wing span for a given critical wing divergence rate. This problem is solved numerically by the Newton method, and the weight advantage is referred to a wing of the same dimensions with a uniform distribution of reinforcing fibers. The second problem is to minimize the weight through optimum distribution zeta (x) of reinforcing fibers over the wing span for a given critical aileron reversal speed. This problem is solved numerically according to the algorithm of successive optimizations. B.W.

N85-24105# Joint Publications Research Service, Arlington, Va.
WAVE MOTION OF THREE-COMPONENT MEDIUM UNDER LOAD MOVING ON PLANE BOUNDARY Abstract Only c34
Kh. A. Rakhmatulin and A. K. Dzhashakuyeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 70 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat. Mekhan. (Moscow), no. 4, Jul. - Aug. 1983 p 100-103 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The problem of two dimensional flow induced by a traveling shock wave is solved for a three component medium such as a mixture of moisture and sand in air. The wave is assumed to travel along the horizontal plane upper boundary of such a medium occupying the entire half space below. The shock wave is described by a quadratic equation of the x = ay + by sup 2 kind. Pressure profiles and profiles of longitudinal velocity and normal velocity characterizing the motion of the medium have been calculated by numerical solution of the corresponding Navier-Stokes and Bernoulli equations for the appropriate boundary conditions regarding the pressure and for various angles to the boundary plane at which the wave propagates. Author

N85-24106# Joint Publications Research Service, Arlington, Va.
DEPENDENTS OF VELOCITY DISTRIBUTION IN EXIT SECTION OF CONVERGING CHANNEL ON SHAPE OF INLET CHANNEL IN REGULATING VALVE Abstract Only c34
A. Ye. Zaryankin, L. G. Golovina, and V. A. Seregin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 71 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 6, Jun. 1983 p 12-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The design of regulating valves for steam turbines, specifically the problem of profiling their inlet channel, is analyzed theoretically from the standpoint of achieving the optimum velocity distribution in the exit section of the converging channel. Limit (maximum-flow) valves with quasiconical stem are considered, their capacity being 50% higher than that of globe valves under the same pressure head. Smooth acceleration of the vapor stream up to nominal velocity is found to be attainable by replacement of the cylindrical channel segment with a converging one and by thus lengthening the seat. This contributes to a more uniform velocity field in the diffuser entrance section, a higher velocity in the neck, and in maintenance of the required flow rate with the same or even a smaller seating diameter. Author

N85-24107# Joint Publications Research Service, Arlington, Va.
EFFECT OF DRAG BEHIND NOZZLE ARRAY ON ITS FORCE AND ENERGY CHARACTERISTICS Abstract Only c02
D. N. Pyasik and M. S. Kolomiyets *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 71-72 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 6, Jun. 1983 p 10-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The effect of drag behind a straight nozzle array of an air turbine on the velocity distribution and thus on the forces and moment at a section of a tilted guide vane was measured with a set of three elastic strain gauges deflecting proportionally to the aerodynamic forces, axial and circumferential, and to the twisting moment respectively. The experiment was performed with an N-4 linear array of 11 uniformly spaced nozzle blades and a cylindrical rod (shaft) with guide vanes movable closer to or farther from the array, at the nozzle exit. These experimental data and theoretical relations were used to determine the dependence of the axial force, the circumferential force, and the twisting moment on the shaft displacement, the dependence of the distance from the lines of action of both forces to the axis of the vane suspension system on the blading form factor, and the dependence of the integral velocity factor and of the stream exit angle on the form factor. B.W.

N85-24108# Joint Publications Research Service, Arlington, Va.
EFFECT OF APPARENT FLUID MASSES ON NATURAL VIBRATION FREQUENCIES OF IMPELLERS OF MULTISTAGE CENTRIFUGAL PUMPS Abstract Only c39
D. V. Grokhovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 72 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 11-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Vibrations of the impeller in multistage centrifugal pumps are analyzed, taking into account the effect of apparent fluid masses. Instead of the conventional engineering relations used for pumps with axial leakage (without seals) and without axial leakage (with seals), a more precise relation is proposed for pumps with contactless ring seals which is based on design analysis and experimental data: omega(sub 0)=k(sub w)omega (sub 0) (sup A) with k(sub w) = alpha(sup 4) + beta) (sup 1/2)(1+[the sum of three terms with k = 1]) epsilon (sub k) (sup-1/2). Here alpha accounts for stiffness of elastic seals and beta accounts for hinge constraint on an impeller mounted in two bearings, K sub w < 1 signifying that the effect of apparent fluid mass is stronger than the effect of elastic forces in the seals. The range of K sub w is 1.0 to 2.5 for alpha = 1 and perfectly coaxial impeller seals. B.W.

N85-24109# Joint Publications Research Service, Arlington, Va.
TURBULENT FLOW AROUND CIRCULAR CYLINDER UNIFORMLY ROTATING IN INFINITE INCOMPRESSIBLE FLUID Abstract Only c34

V. V. Novozhilov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 72-73 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 6, Oct. 1983 p 1322-1326 Original language was announced in IAA as A84-14872 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The problem of flow around a circular cylinder rotating at constant speed is solved for the case of turbulent flow of an incompressible fluid, assuming the fluid medium to be boundless. The fundamental equation follows from Karman's generalized theory. A qualitatively correct trend indicating solution is obtained for n ranging from 2/3 to 5/6 and the Reynolds number Re correspondingly ranging from 1 x 10 to the 4th power to 2 x 10 to the 6th power, without taking into account the curvature of the stream and attendant centrifugal forces. A qualitatively correct solution is then obtained by including the Richardson correction factor for the effect of centrifugal forces on turbulent mixing. A numerical solution has been obtained for n = 3/4, corresponding to the Blasius range 5 x 10 to the 3rd power < or = Re < or = 2 x 10 to the 5th power (for which values of the Richardson correction factor F sub n (Ri are known). Profiles of the average angular velocity have been plotted on this basis and for comparison, also on the basis of the fundamental flow equation integrated in quadratures with F (Ri) = 1 (no correction). The circulation is evaluated analogously, without and with the Richardson correction. Author

N85-24110# Joint Publications Research Service, Arlington, Va.
STABILITY OF VORTEX STRUCTURES DURING SEPARATION FLOW PAST ARRAY OF WINGS Abstract Only c02
A. A. Karask, S. M. Lomov, and M. I. Nisht *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 73 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 6, Oct. 1983 p 1318-1321 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The useful separation effect, formation of promontory vortices at the front edge of wings, provides useful suction for an aircraft. A study was made concerning the stability of such a vortex structure in an air stream during flow past an array of two thin delta wings with the same small aspect ratio, both wings remaining always in parallel planes as their angle of attack varies and the one ahead simulating a tail. In the theoretical part the problem was analyzed numerically on a computer, with the aspect ratio of both wings varied and their relative position varied widthwise and heightwise. In the experimental part the pattern of vortex formation and collapse in a semiopen subsonic wind tunnel with a bilateral Euler chamber was visualized by the shadow method, with an IAB-451 instrument using a cruciform knife edge and a cruciform slit. The results indicate that interaction of vortices at one wing with those at the other tends to improve the stability of both vortex arrays as the angle of attack becomes so large that vortices at one wing alone would become unstable. B.W.

N85-24111# Joint Publications Research Service, Arlington, Va.
HYDRAULIC DRAG OF ROD WITH ARTIFICIAL MICROROUGHNESS IN LONGITUDINAL FLOW Abstract Only c34
V. L. Lulchuk, V. P. Smirnov, K. P. Shuyskaya, A. G. Sorokin, and A. V. Turkin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 74 Transl. into ENGLISH from Teploenerg. (Moscow), no. 7, Jul. 1983 p 46-48 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Results are presented from an experimental study of the hydraulic drag of a rod with artificial microroughness under isothermal conditions under a broad range of flow conditions. The rod was intended to imitate a circular fuel element with regularly alternating spots of microroughness of trapezoidal shape, with each projection 0.1 mm in height, 0.2 mm thick, relative spacing S/h = 10. The experiments were performed with turbulent flow of air in a circular slot between the tube shell with smooth inner surface and the coaxially inserted rough rod modeling the fuel element. An equation is derived which describes the experimentally hydraulic drag. Author

N85-24112# Joint Publications Research Service, Arlington, Va.
STABILITY OF STEADY ROTATION OF A CYLINDER FILLED WITH A STRATIFIED VISCOUS INCOMPRESSIBLE FLUID Abstract Only c34
N. V. Derendyayev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 74 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Sep. 1983 p 1073-1076 Previously announced as N84-32054 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A method is proposed for solving the plane problem of small-scale stability of steady rotation of a cylinder completely filled with a stratified viscous incompressible fluid. The angular velocity of rotation of the cylinder is assumed to be held constant, and its axis is secured in an axisymmetrical viscous elastic mount. An example of the solution of the stability problem using the proposed method is given. It is established that resonant excitation of internal waves within the rotating fluid filling the cylinder is an important factor underlying the occurrence of instability. An example is given of the investigation of the stability of steady rotation of a cylinder completely filled with a stratified viscous incompressible fluid whose distribution density in steady-state rotation is RHO zero (r) = RHO zero exp (alpha r(2)), and whose viscosity distribution RHO zero (r) has a characteristic spatial scale no smaller in order of magnitude than the radius of the cylinder. Author (IAA)

N85-24113# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TURBULENCE OF INCIDENT STREAM ON THREE DIMENSIONAL BOUNDARY LAYER Abstract Only c34
V. V. Burlaka and Yu. V. Grechanichenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 75 Transl. into ENGLISH from Teploenerg. (Moscow), no. 7, Jul. 1983 p 62-64 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The influence of the turbulence of incident stream on the boundary layer under conditions approaching actual operating conditions was studied. The degree of turbulence of the incident stream in theoretical determination of the integral characteristics of the three-dimensional boundary layer was considered using equations averaged across the channel, derived by reducing the three-dimensional boundary layer to a two-dimensional one with three velocity components. The method allows calculation of secondary losses, and it is indicated that the losses found by the method agree satisfactorily with experimental data. E.A.K.

N85-24114# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN OPTIMALLY DESIGNING SHELLS OF REVOLUTION Abstract Only c39
N. V. Banichuk and V. V. Kobelev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 76 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 2, Feb. 1983 p 10-17 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Two problems are considered which arise in design optimization of elastic shells of revolution subject to axisymmetric static loads, specifically shells with a vertically oriented axis. The first problem is to design a shell of minimum mass with strength as the constraint on stresses, to minimize the weight functional and to find the corresponding optimum vertical thickness profile. It is found that equistrength shells satisfy the criterion, also when shearing stresses are produced by twisting moments. The second problem is to design a shell of maximum stiffness to minimize the displacement function, for a shell loaded in torsion with the lower horizontal edge constrained and the upper horizontal edge free. It is solved by the corresponding equation of equilibrium. The optimum vertical thickness profile is determined for a fixed shell volume in which it

is assumed that a given vertical profile of the inside radius or that both the thickness and the inside radius are controllable. E.A.K.

N85-24115# Joint Publications Research Service, Arlington, Va.
REACTION OF PIEZOCERAMIC SHELL TO CONCENTRATED FORCES Abstract Only c39
L. A. Filshtinskiy and L. A. Khizhnyak *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 76-77 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 478-482 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The equations of state are formulated for a piezoceramic shell polarized along its generatrix, in which two of the three othogonal coordinate axes are lines of principal curvatures. These equations relate components of the stress tensor and of the electric induction vector to those of the strain tensor and of the electric field vector. The theory of very shallow shells and the Maxwell equations for a dielectric yield a general system of equations in displacements. This system is solved for the case of an array of T-periodic concentrated forces acting on a shell. From the T-periodic fundamental solution is extracted its principal part, whereupon elements of the Green matrix are determined for a shell of finite dimensions. A cylindrical shell under a load of radial concentrated forces is considered. Expressions are derived for the asymptotic values of bending moments, shearing forces, and electric potentials in the shell. E.A.K.

N85-24116# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF SOLID BODY WITH ELLIPSOIDAL CAVITY CONTAINING MAGNETIC FLUID Abstract Only c34
O. I. Bogoyavlenskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 77 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 440-445 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The motion of a perfectly solid body with an ellipsoidal cavity containing a magnetic fluid was analyzed. The motion of this body is described by the MHD equations and the law of conservation of total angular momentum. The problem of dynamics is solved with the classical approach of considering a time interval sufficiently short for the effects of fluid viscosity and of fluid friction against the cavity wall to be negligible. The resolvent system of three equations, obtained after transformation from Lagrange to Euler coordinates, generalizes the classical equations of motion for a body with an ellipsoidal cavity containing an ideal fluid. The most important integral is that of total energy, the sum of kinetic energy of the fluid + internal energy of the magnetic field + kinetic energy of the body rotation. In the case of zero total angular momentum these equations become analogous to the classical Kirchhoff equations of motion for a solid body with three planes of symmetry in a fluid medium. A two-parametric family of values for the inertia tensor satisfying the Clebsch condition for integrability of the system of dynamics equations is shown to exist for an ellipsoid with any ratio of semiaxes. E.A.K.

N85-24117# Joint Publications Research Service, Arlington, Va.
STABILITY OF STEADY MODES OF MOTION BY AXIS OF ROTATING WHEEL IN NONLINEAR BEARINGS Abstract Only c37
D. R. Merkin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 78 Transl. into ENGLISH from Prikl. Mat. i Mehan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 378-384 Original language was announced in IAA as A83-41203 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The stability of the stationary motions of a rotating unbalanced rotor with ideal and nonideal engines is investigated under the assumption that the reaction of the elastically compliant supports increases with deformation. All the principal parameters of the stationary motions and bifurcation points are determined, and it is shown that a nonideal engine may have a destabilizing effect. The results are applicable to the plane-parallel motion of a rotor rotating on an inertialess isotropic nonlinearly flexible shaft. V.L. (IAA)

N85-24118# Joint Publications Research Service, Arlington, Va.
STABILITY OF PERMANENT ROTATION MODES OF ASYMMETRIC HEAVY SOLID BODY Abstract Only c70
D. V. Andreyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 78-79 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 372-377 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Rotation of a heavy solid body with one stationary point about a vertical axis not passing through its center of mass was analyzed for stability. Three Cartesian coordinates with a common origin at that point are introduced: one stationary with a vertical axis, one whose axes coincide with the principal axes of inertia, and one rigidly tied to the body with one axis being the permanent axis of the body. After linearization of the system of equations of perturbed motion, the conditions for stability of permanent rotation are established on the basis of the Hamiltonian, first in nonresonant modes with the aid of the Staude cone, and then in third-order and fourth-order resonance modes. In all nonresonance modes, stability or instability are determined in the first approximation only, stability or instability of the resonance modes is determined exactly and it is found that it depends only on the distribution of masses in the body. E.A.K.

N85-24119# Joint Publications Research Service, Arlington, Va.
TWISTING OF SEGMENTAL SHAFTS Abstract Only c39
L. V. Konovalov, L. N. Kukleva, A. I. Sanzharevskiy, and M. D. Vinogradova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 79 Transl. into ENGLISH from Vestn. Mashinostroyeniya (Moscow), no. 9, Sep. 1983 p 26-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Torsional stresses in segmental shafts with compound rather than simple circular cross sections are calculated on the basis of the fundamental Poisson equation for the torsional stress potential and the evolving principle of minimum potential strain energy. The solution was programmed in ALGOL for a BESM-6 high-speed computer. Numerical data are obtained by digital simulation for a shaft cross section smaller than a semicircle with a rectangular slot symmetrically cut in the middle of the base. The results yield stress concentration factors needed for design and maximum stresses. The results are more accurate than those based on electrical analog simulation. The method and the results can be extended to shafts with arbitrary cross sections, with the aid of experimental verification. E.A.K.

N85-24120# Joint Publications Research Service, Arlington, Va.
STABILITY OF STEADY MOTIONS OF DYNAMICALLY SYMMETRICAL SOLID AT A TRIANGULAR LIBRATION POINT Abstract Only c70
V. N. Ruzanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 80 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 337-340 Original language document was announced in IAA as A83-32362 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The motion of a dynamically asymmetric solid relative to its center of mass is investigated in the context of a circular bounded problem for three bodies, with the solid located at a triangular libration point. It is assumed that the motion of the principal bodies M1 and M2 with finite masses of M1 and M2 and the motion of the center of mass of the solid are described by the equations for the plane circular bounded problem of three bodies. The dimensions of the solid are assumed to be small in comparison with the distances from its center of mass to M1 and M2, which mekes it possible to disregard the effect of the motion of the solid around its center of mass on the motion of the center of mass proper. The necessary and sufficient conditions for the stability of solutions are determined. V.L. (IAA)

N85-24121# Joint Publications Research Service, Arlington, Va.
APPROXIMATE ANALYTIC METHOD OF CALCULATING TRAJECTORIES OF MOVEMENT OF A FLIGHT VEHICLE IN THE ATMOSPHERE Abstract Only **c05**
N. M. Ivanov, A. I. Martynov, and N. L. Sokolov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 80 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 348-452 Original language document was announced in IAA as A83-32364 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

An approximate method is proposed for calculating the trajectories of a flight vehicle in the atmosphere with allowance for the ablation of the vehicle and the rotation of the planet. It is shown that the method can be effectively used for calculating the entry of a flight vehicle into the dense layers of the atmosphere at high velocities. Numerical examples are presented. V.L. (IAA)

N85-24122# Joint Publications Research Service, Arlington, Va.
STABILIZATION OF STEADY MOTION OF MECHANICAL SYSTEMS Abstract Only **c70**
E. M. Krasinskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 81 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 302-309 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A scleronomic nonholonomic system assuming that forces are applied on both positional and cyclical coordinates was studied. The possibility to stabilize unstable steady motion by application of forces of a predefined structure to the cyclical and positional coordinates is analyzed. It is assumed that the balancing forces depend on the positional velocities. It is found that application of a force on cyclical coordinates can in certain cases stabilize unstable but steady motion. E.A.K.

N85-24123# Joint Publications Research Service, Arlington, Va.
THERMAL DEFORMATION OF FLEXIBLE ROTORS IN FRICTION BEARINGS Abstract Only **c37**
A. S. Goldin, M. I. Lvov, and A. V. Uryev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 81 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 6-9 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

During balancing of the rotor of the R-100 turbine it was found that significant changes in vibration parameters in the bearings were caused by thermal deformations of the cantilever section. The smooth change in vibration parameters with the passage of time and reversible nature of changes indicates the thermal nature of deformation of the rotor, the location of the imbalance indicates that the deformation occurs primarily in the cantilever section of the rotor. A simplified mathematical model of the rotor is analyzed. The following measures are suggested to reduce the influence of thermal deformation on the process of balancing: maintenance of identical conditions of lubrication, including temperature and flow rate of oil, for all balance runs; repeated runs without changing of balancing masses to evaluate the accuracy of determination of vibration parameters; smooth increases in rotor rotation speed during all balancing runs and measurement of vibration parameters with continuous changing frequency; if necessary, separate balancing of parts of cantilever sections. E.A.K.

N85-24124# Joint Publications Research Service, Arlington, Va.
DIMENSIONS OF SMOOTH MATING PARTS WITH PROTECTIVE COATINGS Abstract Only **c37**
P. N. Goberman *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 82 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 37-40 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

In the optical-mechanical industry it is common to mate parts with protective coatings of different thicknesses. A tolerance field must be established for the dimensions of optical parts before they are coated. The tolerance field is a standard one for the industry, for a given enterprise, or a special one for a given set of parts. The tolerance field must consider the fit after the parts are coated. The final fit, allowing for clearance or for interference, is calculated and the feasibility of replacing a special tolerance field with the enterprise standard or the industry standard is examined. A ball bearing on a coated shaft is a case of outer interchangeability, with the shaft dimension serving as reference. A plug in a hole is a case of inner interchangeability, with the hole dimension serving as reference. The procedure is demonstrated on a typical hole and plug pair with coated mating surfaced. E.A.K.

N85-24125# Joint Publications Research Service, Arlington, Va.
ROLE OF FLUID LUBRICANT-COOLANT IN FINE GRINDING OF OPTICAL GLASS BY DIAMOND TOOL Abstract Only **c37**
V. M. Altshuller, Yu. V. Ashkerov, and V. P. Korovkin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 83 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 38-41 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The purpose of correlating the microhardness of large optical surfaces with the performance of a diamond grinding tool and determining the role of a fluid lubricant-coolant in the fine-grinding process, particularly the dependence of its role on its composition were studied. It is indicated that the productivity of the grinding process does not depend on the composition of the lubricant-coolant in the case of glasses with low scratch hardness but is very sensitive to its composition in the case of glasses with high scratch hardness. A 30% aqueous soluton of glycerin is an overall most effective lubricant-coolant, allowing the tool to retain its sharpness for long periods of time but also contributing to its high rate of wear. Plain water is least effective and 1% aqueous solution of triethanol amine or 4% aqueous solution emulsion are of intermediate and more selective effectiveness, involving a tradeoff between sharpness retention with low tool wear and productivity. The role of a fluid lubricant-coolant is determined by changes which occur in the mode of fracture within the glass surface layer and by changes in the rate of tool wear. There is a direct relation between scratch characteristics of glasses and their grindability, but no definite correlation with the retention of tool sharpness is established. E.A.K.

N85-24126# Joint Publications Research Service, Arlington, Va.
STRUCTURAL, MORPHOLOGICAL AND OPTICAL CHARACTERISTICS OF KGd(WO4)2 CRYSTALS Abstract Only **c76**
G. V. Ananyeva, I. I. Afanasyev, A. I. Glazov, I. Ya. Mamontov, and T. I. Merkulyayeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 83-84 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 35-36 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A KGd (WO sub 4) (sub 2) crystal, suitable as active laser material with Nd (sup + 3) doping, has a low-order symmetry which makes determination and normalization of its optical characteristics difficult. Its atomic structure is described by the P/2m group of spatial symmetry. A correspondence between the principal axes and the structure of this biaxial crystal was established by X-ray structural analyses with a URS-50IM X-ray diffractometer and a model F goniometer and optical measurements. Based on this study and plotting of the stereographic projection of such a crystal, its lattice parameters and optical indicatrix are found. Its optical orientation can be described as n sub g = b and n sub pc = 20 deg with the optical axes at an 86.5 deg angle to one another lying in the plane of the crystallographic b-axis zone. E.A.K.

N85-24127# Joint Publications Research Service, Arlington, Va.
SELECTIVE COATINGS FOR SOLAR-TO-THERMAL ENERGY CONVERTERS Abstract Only **c44**
G. A. Gukhman and M. M. Koltun *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 84 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 43-45

(For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A selective coating proposed for flat plate solar collectors consists of a thick Al2O3 layer with embedded metal particles and on it an infrared reflecting layer of electrically conducting vitreous ceramic material (PbO or In2O3). Both layers are deposited electromatically on collectors made of aluminum or an aluminum alloy. A double layer of 2 to 3 micron thick chromium on 9 to 10 micron thick nickel is effective in preventing oxidation on copper surfaces. Specimens of such coatings were tested in a laboratory humidity chamber and are now tested under the climatic conditions in the Crimea, 750,000 Wh/sq m of solar radiation at a mean-weekly intensity of 700 W/sq m having been accumulated in nine months. The ratio of heat absorbint to total surface area is > or = 0.9 and emissivity is < or = 0.2 were not degraded by holding in a furnace at 500 C for 50 h. The feasibility of producing multilayer coatings of this type was established on the basis of computer calculations for various combinations of collector material and protective interlayers. Author

N85-24128# Joint Publications Research Service, Arlington, Va.
ERROR ANALYSIS OF HELIOSTAT ALIGNMENT METHODS Abstract Only **c44**
R. A. Zakhidov, A. Abdurakhmanov, Sh. I. Klychev, and V. M. Bogdasarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 85 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 22-26 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Four basic methods available for alignment of heliostats are: (1) with use of levels; (2) by autocollimation; (3) on basis of superposed images; and (4) on basis of broken images. All involve placement of a reflecting facet surface into a definite position relative to a stationary reference plane. The actual alignment operation is preceded by drawing normals to the reference plane and to the given facet, respectively, each operation being repeated for each facet. The accuracy of each step is limited by inevitable systematic errors. The derivation of the total error in each method reveals their particular features and preferential ranges of application. Author

N85-24129# Joint Publications Research Service, Arlington, Va.
RESISTANCE OF OPTICAL COATINGS TO ALKALI SOLUTIONS AND SEA WATER Abstract Only **c74**
A. Ya. Kuznetsov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 85 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 59-61 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The resistance of optical coatings of SiO2, TiO2, ZrO2, HfO2 films and their combinations to alkali solutions and to sea water was measured in an experimental study with such coatings chemically deposited on highly resistant K8 glass as substrate. Specimens initially 120 nm thick were soaked in NaOH solutions with various concentrations from 0.1 N to 0.9 N at 20 C and at 50 C for up to 60 h. Least resistant was found to be SiO2 and then TiO2, ZrO2, HfO2 in increasing order. Other specimens initially 130 nm thick were soaked in sea water containing 3.5 wt.% NaCl + 0.3 wt.% MgSO4 (simulating Pacific Ocean water with pH 7.6) under the same conditions. Scattering of light by SiO2 coatings began to increase after 30 days at 50 C but not till after 50 days at 20 C. The other coatings broke down after 50 days at 50 C and after 90 days at 20 C, first SiO2 and then TiO2, ZrO2, HfO2 successively later. Author

N85-24130# Joint Publications Research Service, Arlington, Va.
TRANSDUCER OF LINEAR DISPLACEMENTS Abstract Only **c35**
Ye. R. Malamed *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 86 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 35-37 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The basic PLP transducer is designed for a UIM-29 microscope and a 2-coordinate measuring instrument with electronic digital readout. Its optical system consists of an AL-107B light-emitting diode as light source, two condenser lenses, a special wedge carrying two pairs of joined receiver lenses, a prism-mirror, a photoreceiver, a wedge-shape transparent replica of a twin diffraction grating which prevents light reflected by the air-glass interface from focusing on the receiver photodiodes, and a reflective replica of a diffraction grating on a movable carriage. The already available three models of this transducer are PLP1-0.2, PLP1-0.5, and PLP1-1.0 with respectively 625, 250, 125 lines/mm on the transparent replica and respectively 312.5, 125, 62.5 lines/mm on the reflective replica. The scale of moire-interference fringes characterizing the shift between both diffraction gratings per grating period (9.16 mm in each model) is respectively 0.8, 2.0, 4.0 microns and the angle between the two arrays of grating lines on the transparent replica is respectively 36 + or - 4 deg, 90 + or - 10 deg, 190 + or - 20 deg. Author

N85-24131# Joint Publications Research Service, Arlington, Va.
NONUNIFORM INTERFERENCE COATINGS WITH THICKNESS-DEPENDENT REFRACTIVE INDEX Abstract Only **c27**
I. F. Bokhonskaya and T. N. Krylova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 86-87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 26-28 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

Nonuniform transparent films with a refraction gradient are used as coatings on optical glass for achromatization of interference coatings, particularly for widening the spectral range of low residual reflection where the first layer of such a two-layer coating has a nonuniform refractive index at the film-substrate interface. A computer program was developed for calculating the reflection spectrum of glass surfaces with such coatings whose refractive index decreases linearly with their thickness down to values close to those of the substrate glass relative to air. These calculations, by the recurrence method, take into account multiple reflections. The results of calculations for five grades of glass with the refractive index relative to air n = 1.518, 1.659, 1.703, 1.755, 1.806 respective reveal that addition of films with a refractive index decreasing to 1.45 ... 1.40 ... 1.35 ... 1.20 decreases the reflection from 8 ... 4 to 3.2 ... 2.8 ... 2.2 ... 0.8%. Results with SiO2, TiO2, and Teflon 32 films (n = 1.45 to 1.40) on TF5 glass confirm this. Author

N85-24132# Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF MgF2 FILM FORMATION AND OPTIMIZATION OF MgF2 FILM DEPOSITION PROCESS Abstract Only **c27**
V. P. Poveshchenko, N. G. Kostyuchenko, V. V. Ponkratov, V. M. Kholodov, V. I. Mozgin, and Zh. P. Trofimova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 87 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 24-26 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The maximum temperature at which subsequent exposure to air would not change the optical properties of MgF2 films was determined as well as the feasibility of shortening the process time. The temperature of the substrate during film deposition under a vacuum of 0.00001 mm Hg was varied from 50 to 300 C. Phase analysis of the raw compounds and of the product was performed with an X-ray diffractometer; the parameters of their crystal lattices were calculated within + or - 5% accuracy on a YeS-1020 computer. One set of results reveals the parameters alpha and c of the tetragonal crystal lattice decrease with increasing deposition temperature. Another set of results reveals that the refractive index of MgF2 films does not depend on the holding time at 300 C. Air exposure of specimens held at temperature up to 100 C affected neither the phase composition nor the refractive index. Deposition with accelerated heating, without subsequent cooling to 100 C should shorten the total process time by 50 min and yield films with consistent excellent characteristics. Author

N85-24133# Joint Publications Research Service, Arlington, Va.
WATER-RESISTANCE AND SOME OTHER PROPERTIES OF POLYALKALI FLUOROPHOSPHATE GLASSES Abstract Only **c27**

L. V. Fedorova, V. S. Molchanov, L. N. Urusovskaya, and A. N. Zvenigorodskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 88 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad, no. 7, Jul. 1983 p 22-23 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The water resistance and chemical stability as well as some optical properties of several fluorophosphate glases with alkali content were determined experimentally. The base material was glass containing 57.8% NaF + 18.4% Al(PO3) + 14.0% RF + 5.8% B2O3 + 4.0% BaO. Various modifications were derived through addition of LiF, MgF2, BaF2, PbF2, SrO, BaO, PbO, GeO2, ZrO2, Nb2O5, Ta2O5, WO3 respectively. The effect of water on the resistance to tainting and dissolution by chemicals was measured by a special method, using a silver vessel with distilled water at 90 C and rotating the immersed specimen for 1 h, weighing the dry specimen before and after that treatment. Results indicate that addition of SrO, BaO, PbO, BaF2, and PbF2 does not affect the water resistance of glass, while every small additions of Ta2O5, ZrO2, WP3, and GeO2 increase it appreciably. The MgF2 has a beneficial effect on the water resistance and LiF has no effect.
A.R.H.

N85-24134# Joint Publications Research Service, Arlington, Va.
THRESHOLDS OF OPTICAL BREAKDOWN IN ALKALI-HALIDE CRYSTALS UNDER PULSES FROM CO2-LASER Abstract Only **c76**

N. V. Volkova, V. P. Krutyakova, V. N. Smirnov, and P. N. Tsirulnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 88-89 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 10-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The breakdown-threshold energy density, the absorption coefficient at the lambda = 10.6 microns wavelength, the relative scattering of 10.6 microns and 0.63 micron waves, and the photoluminescence intensity were examined in laser irradiated NaCl, KCl, and KBr industrial crystals, with at least two lateral faces polished. Results indicate that optical breakdown in these crystals is facilitated by the presence of absorbing inhomogeneities, NaCl having the highest thresholds. No correlation was found between photoluminescence intensity and breakdown threshold or between relative scattering levels and breakdown threshold. The results suggest that crystals with an absorption coefficient corresponding to the highest degree of purity should have a low concentration of absorbing inhomogeneities and high thresholds of optical breakdown.
Author

N85-24135# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR AUTOMATIC RECORDING OF VIBRATION PARAMETERS Abstract Only **c35**

B. I. Fedorov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 89 Transl. into ENGLISH from Vestn. Mashinostroyeniye (Moscow), no. 9, Sep. 1983 p 25 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A system for automatically recording vibration parameters consists of 20 accelerometer channels with signal transducers followed by low-pass filters, and one frequency-to-voltage conversion channel. A voltmeter is connected to each channel through a commutator switch and so is a timer which feeds the voltmeter readings to a transcriber for printout and alphanumeric documentation. The printer is also connected to the commutator switch through a device which matches recorded data with the corresponding pickup channel. This SAR-21 system was designed with maximum use of series produced components. Its measurement ranges are 0-600 m/sq acceleration and 20 to 2500 Hz frequency. The recording time is 0.04 s for any one parameter and the error of the system does not exceed + or - 2%.
Author

N85-24136# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ROUGHNESS ANALYSIS OF TREATED SURFACES WITH HIGHER-CLASS FINISH BY METHODS OF X-RAY REFLECTOMETRY Abstract Only **c74**

V. M. Sinayskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 90 Transl. into ENGLISH from Izmeritel. Tekhn. (Moscow), no. 6, Jun. 1983 p 27-29 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The roughness of surfaces with class 13-14 (0.05 to 0.10 micron) or better finish using a narrow incident beam of X-rays at low glancing angles to the treated surface. The integral variant of this method involves measuring the integral intensity of the reflected signal as function of the incidence angle and determining the critical angle. The differential variant of this method involves determining the intensity distribution over the profile of the reflected signal, that profile being described by its width, the integral intensity, the peak intensity, and the intensity as function of double the incidence angle. Experimental data necessary for calibration are obtained with a special high precision X-ray reflectometer. Both methods were tested on surfaces of steel, glass, and beryllium. Based on attainable accuracy limits of 0.5% and 0.25% in measurement of radiation intensity and critical angles respectively, it is thus feasible to determine the surface roughness within + or - 0.01 micron by the integral method and within + or - (0.015 to 0.02) micron by the differential method.
Author

N85-24137# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF PARAMETERS OF ELASTICALLY STRAINED MIRROR FACETS OF RAPIDLY ROTATING PRISMS Abstract Only **c39**

V. S. Trachuk, A. P. Romashkov, and A. F. Kotyuk *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 90-91 Transl. into ENGLISH from Izmerit. Tekhn. (Moscow), no. 9, Sep. 1983 p 42-44 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

A major problem in the design and manufacture of prism type mirrors for rotation at speeds above 1000 rps is predicted and accounting for elastic strains, which degrade the performance of such devices in optical systems for measuring the space time characteristics of optical pulse radiation. This problem is treated on the basis of the theory of elasticity, considering that the plane of a rotating prism facet becomes a cylindrical surface with a plane curve as directrix. For simplification, only the normal displacement component is retained and the tangential displacement component is disregarded. The shape of the directrix is determined by the combination of order of axial symmetry of the prism cross section and Poisson ratio of the mirror material. Theoretical computer data checked against experimental data on steel and beryllium mirrors rotating at 5000 rps. A plane mirror facet of a material with theoretically zero but practically a very low Poisson ratio, such as beryllium, remains a plane one but shifts parallel to itself during rotation.
Author

N85-24138# Joint Publications Research Service, Arlington, Va.
STUDY OF FATIGUE STRENGTH OF SHAFTS WITH SEGMENTED CHANNELS Abstract Only **c39**

I. V. Kudryavtsev, N. A. Shokov, and N. M. Savvina *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 91 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 9-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The influence of segmented channels as structural factors on the fatigue strength of rotor shafts was studied using cylindrical models 70 and 200 mm in diameter with segmented channels. The influence of hardening by surface plastic deformation on fatigue strength of rotor steel was also studied. The tests allowed experimental determination of dangerous points in the cross section, the locations where the segment channels meet the cylindrical surface. Microstructural studies reveal that cementite grains were significantly reduced in size and located in a less

ordered manner than in the initial state before fatigue testing. The tests indicate more uniform accumulation of fatigue damage in models worked by surface strain hardening. Surface strain hardening increased the fatigue resistance of 70 mm models from 85 to 155 MPa, of 200 mm diameter models from 45 to 170 MPa. The method of surface plastic deformation is therefore recommended to increase the fatigue strength of large shafts with segmented channels. Author

N85-24139# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ERRORS OF ACOUSTIC GONIOMETER INFORMATION-MEASUREMENT SYSTEMS ON ROCKING BASE Abstract Only c35
I. Ya Naumenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 92 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 7-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

The accuracy of azimuth information measurement systems which determine the direction of arrival of an acoustic wave front is limited severely by the angular errors which occur when the device is operated on an unstable base, such as a rocking ship. The conversion equation of such a device subjected to rocking type destabilizing factors is examined and the resulting errors are estimated. Author

N85-24140# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
23 Apr. 1984 56 p Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-012) Avail: NTIS HC A04/MF A01

Developments in applied science and technology are reported. Some topics of discussion are: remote sensing and geology, using geological research to promote prospecting, testing in transonic and subsonic wind tunnels, applications of ultrasonic technology and advances in study of cold injuries. For individual titles, see N85-24141 through N85-24145.

N85-24141# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING: NEW TOOL FOR CHINA'S GEOLOGISTS c43
Yang Guangqing *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 5-16 Transl. into ENGLISH from Zhongguo Dizhi (Peking), no. 1, 13 Jan. 1984 p 17, 18-23 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

Work in organization structure, personnel training, technical equipment, popularizing and extend remote sensing technologies, and in extending applied results is reported. Investigations in hydrogeology, engineering geology and environmental geology are examined. Surveys for water conservation construction and beach conditions, environmental pollution surveys, agricultural surveys, urban planning are some examples of how remote sensing technologies is applied. Advances and disadvantages of applying remote sensing to geological work are explored. E.R.

N85-24142# Joint Publications Research Service, Arlington, Va.
INVESTIGATIVE REPORT ON USING GEOLOGICAL RESEARCH TO PROMOTE PROSPECTING c46
In its China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 17-23 Transl. into ENGLISH from Keyan Guanli (Peking), no. 1, 1984 p 15-18 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

The use of science and technology in geological prospecting is explored. Some points discussed are: (1) Integrated Geochemistry prospecting requires development of specialized research; (2) Synthesis and collation of data from previous investigations permits restudying and reprocessing of geological problems; (3) Opening up new spheres of geological work requires advancement in scientific research; and (4) The integration of geological work with new technologies and methods equals progress. E.R.

N85-24143# Joint Publications Research Service, Arlington, Va.
HARBIN'S SUBSONIC, TRANSONIC WIND TUNNEL DETAILED c09
Wang Ruifu and Fan Jiechuan *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 36-40 Transl. into ENGLISH from Guoji Hangkong (Peking), no. 8, 5 Aug. 1983 p 6-7 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

Technical modifications on a 0.52m x 0.64m subsonic and transonic wind tunnel is discussed. The wind tunnel has been in operation since July 1982, during which time several thousand wind tunnel tests have been performed with satisfactory results. The technical modifications include the following: for the first time the wind tunnel uses a test section made of a single point support, semiflexible wall nozzle and slanted hole walls with variable open-shut ratio or low noise slanted hole plates; a DJS-622 computer is used to control the wind tunnel operation and to perform automatic collection and real time processing of test data; the test Mach Number can be varied continuously from 0.3 to 1.5 to provide an extended range for conducting low supersonic tests, and an advanced test procedure for studying the wall characteristics of a transonic wind tunnel. E.R.

N85-24144# Joint Publications Research Service, Arlington, Va.
APPLICATIONS OF ULTRASONIC TECHNOLOGY c71
Ma Yunjie *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 41-42 Transl. into ENGLISH from Yiqi Yu Weilai (Peking), no. 12, 1984 p 5 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

Ultrasonic technology is the study of the use of ultrasonic waves in production techniques and in related measurement techniques and instrumentation. Through ultrasonic generators, mechanical energy or electromagnetic energy is converted into ultrasonic energy to produce the desired mechanical, thermal, optical, electrical, chemical and biological effects. Ultrasonic devices are growing rapidly both in this country and abroad. Not only are they used extensively in industrial and agricultural production, medicine and health but also in people's daily lives. Some representative examples of ultrasonic technology applications are presented. Author

N85-24145# Joint Publications Research Service, Arlington, Va.
ADVANCES IN STUDY OF COLD INJURY IN ARMY c52
Liu Enbo *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 48-52 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Peking), no. 6, 20 Dec. 1983 p 469-470 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

Progress in the prevention and treatment of cold injuries is examined. Some aspects discussed are: factors for the prevalence, pathogenesis and treatment of severe cold injury; cold endurance physical training; and cold prevention and heat preservation. E.R.

N85-24146# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
27 Mar. 1985 60 p Transl. into ENGLISH from various Russian articles
(JPRS-UMM-85-006) Avail: NTIS HC A04

An overview of advancements in Russian machine tool technological advancements is presented. Included are CNC machine tools, their design, function, and applications. Also mentioned are economic and expansion plans for the industry as well as measures for technological assessments. For individual titles, see N85-24147 through N85-24151.

N85-24147# Joint Publications Research Service, Arlington, Va.
METAL WASTE IN MACHINE TOOL INDUSTRY EXAMINED
L. Zusman *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 6-12 Transl. into ENGLISH from Materialno-Tekhn. Snabzheniye (Moscow), no. 6, Jun. 1984 p 14-19 (For primary document see N85-24146 14-31)

Avail: NTIS HC A04

An indispensable condition for the intensive development of the economy is social production's systematic material-saving character. The minimum limits of basic material resource economy that must be achieved were determined. The cautious expenditure of metal in machine building and metal working have special significance among them. As important as technological metal use indicators are, the evaluation of metal demand in construction as well as the operating metal content of machines attract special attention. These three coefficients together present a picture of the total level of metal product utilization both in machine building and in the operating process of its product. G.L.C.

N85-24148# Joint Publications Research Service, Arlington, Va.
NEW CNC TURNING CENTERS DESCRIBED c37

V. N. Rodionov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 13-16 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 8, Aug. 1984 p 5-6 (For primary document see N85-24146 14-31)
Avail: NTIS HC A04

The KT141P machine tool is designed to do various turning work in the semi-automatic cycle, including turning and boring cylindrical, conical and curvilinear surfaces, single-start and multiple-start threading and center drilling holes. Machining is done in chucks or other special fixtures. The high power and tool availability per productive unit, wide range of spindle and carriage speeds, great rigidity and vibration resistance, precision parameters of the machine tool maintained for long periods -- all these make it possible to machine complicated parts in the rough, as well as in the finish modes, including power and high speed cutting with tools made with metal-ceramic and hard alloy inserts; and parts which require very great precision and surface smoothness. The convenient location of controls; automation of basic and most auxiliary operations; good access to the working zone and devices, service in the process of operation; use of standard cutting tools; and availability of necessary interlocks make the work on the machine tools efficient and safe. G.L.C.

N85-24149# Joint Publications Research Service, Arlington, Va.
LARGE CNC MACHINING CENTER FOR TURBINE PRODUCTION c37

A. G. Nepryakhin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 17-19 Transl. into ENGLISH from Mekhan. i Avtomatiz. (Moscow), no. 6, Jun. 1984 p 1-2 (For primary document see N85-24146 14-31)
Avail: NTIS HC A04

The Novosibirsk Tyazhstankogidropress Machine Tool Building Association developed a CNC planer machining center for machining large high precision parts equipped with necessary tools, metals and quality control devices. The machining center is made with a movable gantry. It can machine the lower and upper half of housings separately for cylinders of high pressure steam turbines for nuclear electrical power plants with steam-tight joints, matching mounting holes and bearing faces of turbines. G.L.C.

N85-24150# Joint Publications Research Service, Arlington, Va.
SPECIFICATIONS OF NEW INDUSTRIAL LASERS REVIEWED c36

V. G. Osipova *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 20-26 Transl. into ENGLISH from Mekhan. i Avtomatiz. (Moscow), no. 6, Jun. 1984 p 25-27 (For primary document see N85-24146 14-31)
Avail: NTIS HC A04

Laser types made of solids, gas, semiconductor chemical and organic paints have found wide application in science and technology. Lasers are used in such various sectors of the national economy as instrument making, machine building, machine tool building, automobile building, aviation equipment, construction, agriculture, etc. G.L.C.

N85-24151# Joint Publications Research Service, Arlington, Va.
MINISTER B. V. BALMONT ON STATUS OF AUTOMATION DRIVE

N. Lyaporov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 34-37 Transl. into ENGLISH from Pravda (Moscow), 13 Dec. 1984 p 2 (For primary document see N85-24146 14-31)
Avail: NTIS HC A04

Machine construction has been called the core of industry. There is a field that has moved to the leading edge of the struggle for technical progress in machine construction. This is the tool and machine tool industry. The Ministry of The Machine Tool and Tool Building Industry provides the equipment for a whole range of industries accounting for more than a quarter of all industrial products and plans a major role in their retooling. The accelerated development of the production of the most advanced and efficient types of equipment, including machine tools, NC machines, automated production lines, industrial robots and robotic machine tool systems is anticipated. G.L.C.

N85-24152# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT

4 Mar. 1985 37 p ref Transl. into ENGLISH from various Russian articles
(JPRS-UMM-85-004) Avail: NTIS HC A03

News items, abstracts, and scientific reports on aspects of machine tools and metal working equipment including technology planning and management automation; process controls and automation electronics; industry planning and economics; automated lines and aggregated machining systems; and robotics are discussed. For individual titles, see N85-24153 through N85-24156.

N85-24153# Joint Publications Research Service, Arlington, Va.
AUTOMATED, ROBOTIZED FORGE-PRESS SYSTEMS VIEWED

M. N. Khmelnitskiy *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-004) 4 Mar. 1985 p 10-12 Transl. into ENGLISH from Kuznechno-Shtempovochnoye Proizvod. (Moscow), no. 5, May 1984 p 14 (For primary document see N85-24152 14-31)
Avail: NTIS HC A03

Models of industrial robots with load-lifting capacities of 0.08, 0.63, 1.25, 3.5, 10 and 40 kilograms, as well as manipulators with load-lifting capacities of 16 and 50 kilograms for forging rolls were developed. Robot equipment is being developed as the creation of unit design industrial robots. The unit principle of robot design increases their reliability, reduces manufacturing costs, and times for introduction. Requirements for new equipment are discussed. B.G.

N85-24154# Joint Publications Research Service, Arlington, Va.
ROBOTS FOR APPLICATION IN FORGE-PRESS OPERATION c37

L. M. Orestova *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-004) 4 Mar. 1985 p 17-22 Transl. into ENGLISH from Kuznechno-Shtempovochnoye Proizvod. (Moscow), no. 5, May 1984 p 39-46 (For primary document see N85-24152 14-31)
Avail: NTIS HC A03

Specifications for the following modular industrial robots are described: MRV-902 angular manipulator; AMPPU-3 NC automatic manipulator; MRL-200-901A Linear Manipulator; SM-100 balanced manipulator; and the MRLU-200-901 linear-angular manipulator. Specifications include: load lifting capacity; linear motion; horizontal and vertical, grip rotation, positioning accuracy drive, control system, power supply, pressure, size, and weight. B.G.

N85-24155# Joint Publications Research Service, Arlington, Va.
MODULAR DESIGN, VERSATILITY OF ROBOTS VIEWED c37

V. V. Tochilkin and Yu. I. Melentyev *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-004) 4 Mar. 1985 p 23-26 Transl. into ENGLISH from Mashinostroitel

(Moscow), no. 3, Mar. 1984 p 14 (For primary document see N85-24152 14-31)
Avail: NTIS HC A03

The widespread introduction of robot systems in various branches of industry raises the problem of their application in existing old line production environments. The development of compact industrial robots based on modular components allowing the robots to work in various production sectors with fully usable degrees of movement is essential to solving this problem. The manipulator's modular design allows efficient use of work space, an improved level of technical service and improved operating conditions through rapid and simple manipulator component replacement. As a result, total system reliability and smoothness is increased. B.G.

N85-24156# Joint Publications Research Service, Arlington, Va.
INTEGRATED CONTROL SYSTEM FOR FMS COMPONENTS
S. A. Marchenko and V. G. Bril *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-004) 4 Mar. 1985 p 26-29 Transl. into ENGLISH from Mekh. i Avotmat. Proizvod. (Moscow), Jun. 1984 p 18-19 (For primary document see N85-24152 14-31)
Avail: NTIS HC A03

A solution for coupling NC UPM-772 to SM-1 and SM-2 UVK computers was developed. The solution is based on the fact that in the UPM-772, communications between the computer and the unit for controlling the memory on a cassette magnetic tape BU KNML are organized over a standard type 2K communications channel. Modifying the UPM-772 NC device has the following advantages: practically unlimited memory for control programs; the possibility of correcting existing and synthesizing new control programs in the UVK (control computer); increasing the speed of operation of searching for necessary data on magnetic tape; and higher reliability. B.G.

N85-24157# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ENGINEERING AND EQUIPMENT
19 Jul. 1984 58 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-84-005) Avail: NTIS HC A04

Activities are reported in aeronautical engineering; surface transportation; nuclear energy; industrial technology; turbines; navigation and guidance systems; and mechanics of fluids and solids; and in testing and materials. For individual titles, see N85-24158 through N85-24182.

N85-24158# Joint Publications Research Service, Arlington, Va.
SELECTION OF EFFECTIVE ARRANGEMENT OF HEAVY UNDERCARRIAGE SYSTEMS FOR USE WITH CONCRETE RUNWAYS Abstract Only c05
T. M. Avdyukhina *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 1 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 83-85 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Various arrangements of heavy aircraft landing gear for use on concrete runways was studied. Running gear mass is used as the optimization criterion. It is found that as the number of wheels increases there is no stable tendency toward decreasing landing gear mass. In the 200-250 t takeoff weight range as the number of wheels varies from 8 to 24 for 4-truck landing gear, 12 to 36 for 6-truck landing gear, landing gear mass does not decrease smoothly. The optimal number of wheels on aircraft with a takeoff weight of 200 t is found to be 12 for both 4 and 6 truck landing gear. Author

N85-24159# Joint Publications Research Service, Arlington, Va.
DURABILITY CALCULATION OF WING PANEL ELEMENT Abstract Only c05
A. V. Kirillov and A. S. Mostovoy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 1-2 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 12, Dec. 1983 p 32-26 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

About 85% of all fatigue fractures in aircraft structural components occur in joinings. Thus it is important to be able to predict durability of these components. A method of determining the durability of the joint of a wing panel element was considered using stringer loaded by cyclic asymmetric tension. The stringer is demountable, and has on central and two lateral fish plates at the connection points. All components of the joint were made of D16T alloy. The proposed method of determining durabillity is based on the linear-discrete hypothesis of accumulation of fatigue damage. A flowchart is given of a program for simulation of the process of fatigue on the M4030 computer. The results of calculation show satisfactory agreement with experimental data from a plant of the Ministry of the Aviation Industry. Author

N85-24160# Joint Publications Research Service, Arlington, Va.
PLANNING OF AIR CUSHION TRANSPORT VEHICLES Abstract Only
A. A. Badyagin, A. I. Baydin, and B. S. Shcherbakov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 3 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 85-88 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The design of an air cushion vehicle in which bypass engines are used to provide the air for the air cushion and the reaction force to move the vehicle was studied. When the engines are first started, all of the air from the outer path is used to create the air cushion. As the vehicle accelerates, less of the air from this path is used to support the cushion, and finally at full speed all of the air is used to move the vehicle, with aerodynamic forces maintaining the cushion. It is concluded that there is an optimal ratio of air flow through the two paths in the engine. The optimal length of the acceleration run increases with increasing mass of the vehicle. Author

N85-24161# Joint Publications Research Service, Arlington, Va.
AUXILIARY UNITS FOR ROBOTS c37
S. I. Kruglov and Yu. V. Mironovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 9-11 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 1, Jan. 1984 p 19 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Feeders of the lifting type (two standard sizes) and a feeder of the revolving type are designed for flat stock. The units are of the floor type and are controlled in the automatic mode by the control systems of robotic systems (RTK's). The stock is secured by readjustable bases of individual holders. Specifications for both kinds of feeders are listed. A.R.H.

N85-24162# Joint Publications Research Service, Arlington, Va.
ROBOTIZED SYSTEM FOR TREATING GEAR WHEELS Abstract Only c37
V. M. Gilod, F. I. Kaplunskiy, and A. G. Umerenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 12-13 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 1, Jan. 1984 p 19-20 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Industrial robots are used in heat treating mainly in the operations of loading and unloading furnaces and salt baths, and also for testing the hardness of parts and for marking and stocking them. The robotized system which has been developed for heat treating gear wheels contains a revolving feeder, a robot, (Tsiklon 5.01), a model I32/80 electrothermic unit, and a receiving container. A holder with blanks is put into the feeder, from which the robot grasps a blank and puts it into the electrothermic unit. Upon the completion of heat treating, the robot puts the blank into the container. After complete loading of the holder, the feeder's table turns and puts the next holder into the feeding position. The load lifting capacity of one arm of the robot is 5 kg; the number of degrees of mobility (without grasping) is from four to six; the robot's

drive is pneumatic. The maximum height of the stack of blanks in the revolving feeder is 600 mm and the lifting rate for blanks is from 0 to 0.046 m/s, and the feeder has an electric drive. The robotized systems are attended to by an operator who operates the systems and loads holders. With this the equivalent of two people are freed. Author

N85-24163# Joint Publications Research Service, Arlington, Va.
MODERNIZATION OF RUNNING GEAR OF CRANE **c37**
A. I. Zhabin, V. A. Romashchenko, and B. M. Kivenson *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 14-23 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 1, Jan. 1984 p 23-24 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The service life of wheels and rails is extended by using additional devices which eliminate sliding friction of the flanges against the rails, by imparting to the running gear the ability to self-balance the crane in the process of its moving along the rail track, and by making possible self-alignment of the running wheels in the horizontal and vertical planes. Sliding friction of the flanges against the lateral face of the rail can be totally eliminated by installing lateral rollers on each wheel, and conical rolling-contact bearings on both sides of the rail. Lateral rollers on overhead-track hoists with a load lifting capacity of two tons with a separate drive reduced loads on the drive and running wheels by a factor of 10 to 12. Bevel-type running wheels and the reverse bevel method make it possible to align the crane and to reduce by a factor of three to five the amplitude of variations in the mechanical trajectory. The friction of flanges against the rails is practically eliminated and the service life of flanges is increased by a factor of at least three to four. A.R.H.

N85-24164# Joint Publications Research Service, Arlington, Va.
STUDY OF AXIAL BEARINGS WITHOUT OIL BATH WITH RADIAL COOLING OF BLOCKS Abstract Only **c37**
Ye. I. Zaretskiy, L. P. Serezhkina, A. A. Pipin, and I. I. Tsybulnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 24 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 11, Nov. 1983 p 11-12 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Losses by friction in axial bearings of fossil-fuel and nuclear electric plant turbines amount to 0.1 to 0.17% of the developed power. A large part of the power losses occur because of disk friction. In order to eliminate friction and increase the efficiency coefficient of the turbine the Kharkov Turbine Plant developed axial bearings without oil baths with individual lubricant supply for each block. In a bearing with a diameter of 585 mm and 1200 sq cm working surface, a two-layer box made of thin plate with a rigid base is established and linings form input and output chambers and slot grooves. Oil is forced into the cooling channel and over the working surface and passes from one block to the next. Effectiveness of the oil feed was tested by removing outlet channels and this led to a load-carrying capacity loss of 30%. Transport is effected by a pressure differential. Experimental results show superiority of the method over an oil bath with significant temperature advantages. Load-carrying capacity, with improved block bases, attained 900 kN. The complex channels may clog and carrying capacity could be reduced by one-half if oil is not kept clean. Author

N85-24165# Joint Publications Research Service, Arlington, Va.
CUTTING STRUCTURAL MATERIALS IN VACUUM Abstract Only **c37**
P. G. Petrukha, P. D. Bespakhotnyy, Yu. D. Koziner, and V. I. Orlov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 25 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 61-64 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A series of experiments was performed to study the influence of cutting rate and thickness of the layer being cut on cutting force and deformation of the layer separated during cutting in a deep vacuum without cooling. Flat specimens were made of materials with various properties, including titanium, copper, aluminum and steel. Cutting tools included high speed steels and hard alloy plates. The process was one of free orthogonal cutting at 13 to 508 mm per minute, thickness of separated layers 0.3 mm, width 2 mm. Low speed cutting reduces the influence of temperature in the cutting zone on the deformation process. Another series of experiments was used to study the influence of various degrees of vacuum on cutting force, the process of deformation of the metal in the cutting zone, processes of friction and tool wear. It was found that as vacuum increased, the most active wear occurred near the cutting edge. All the parameters studied increased with increasing vacuum, a result of activation of adhesion and diffusion processes in the contact zone. Author

N85-24166# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF TRANSPORT OPERATIONS OF ERGATIC ROBOT Abstract Only **c37**
V. Ye. Metlin and A. S. Yushchenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 28-29 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Mash. (Moscow), no. 8, Aug. 1983 p 57-60 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Ergatic manipulation robots, i.e., those controlled by a human operator, were studied. The capabilities of the operator for performing operations by means of semiautomatic manipulation systems were reviewed, in which the operator has control of the motion of the gripper by means of a multiple-degree lever, while the signals for controlling the manipulator drives are computer-generated. It is experimentally shown that there is a rather narrow range of variation in generalized parameters of the manipulator control system where the operator can successfully work and adapt to changes in the parameters of the hardware part of the system. This range depends considerably on the method of manipulator control, which may necessitate adjusting the parameters of the control system when changing from one method of control to another. Conventional mathematical models of manipulator control systems can be used to determine such generalized parameters as the time constant of the system, gain, and damping constant. G.L.C.

N85-24167# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS OF OPTIMUM JOURNAL DESIGN FOR DISK-DRUM ROTORS UNDER ANTISYMMETRIC LOADING Abstract Only **c37**
N. P. Znamenskiy and N. I. Koterov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 29 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 10, Oct. 1983 p 68-71 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The problem of optimizing the shape of the middle surface of the bearing journals of disk-drum rotors was studied. As the problem of total optimization of the journal is rather complicated, a simplified version was considered for partial optimization with respect to individual parameters. An analysis was made of the possible influence that the shape of the middle surface and the thickness of the journal have on pliability under antisymmetric loading. The problem reduced to finding a shell with maximum stiffness and minimum pliability. It is shown that optimum thickness profiling is the most effective way to increase journal rigidity. The analysis is based on the formalism of normal integral equations developed for calculating antisymmetric deformation of shells of revolution. Author

N85-24168# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIAPHRAGM LEAKAGE ON TURBINE STAGE CHARACTERISTICS Abstract Only **c37**
L. I. Kirillov, K. L. Lapshin, V. N. Sadovnichiy, V. D. Gayev, and V. S. Fomin *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 30 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 11, Nov. 1983 p 6-9 (For primary

document see N85-24157 14-31)
Avail: NTIS HC A04

Turbine design optimization and the computation of axial forces requires reliable data on the effects of diaphragm leakage on turbine effectiveness. Leakage through the diaphragm packing cannot be avoided in the intermediate stage and reduces the efficiency coefficient. Gas dynamic computations of infiltration effects are based on experimentally grounded equations and there are differences in specialist opinion as to precise determination of energy losses. Therefore, experiments were done with an EVT-2 turbine with a flow meter in which packing rings and turbine wheel disk vents could be varied. Formulas were established for estimating the effects of accumulated energy losses on the efficiency coefficient and for estimating effects on the turbine stage of working fluid infiltration and suction through the rotor blade region. The design problem consists essentially in minimizing efficiency reduction taking into account axial forces on the rotor and in each specific case an optimal design must be selected for handling diaphragm infiltration flow. Author

N85-24169# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF FATIGUE STABILITY OF GAS-TURBINE ENGINE COMPRESSOR VANES IN PROBABILISTIC ASPECT Abstract Only **c37**
A. V. Prokopenko and M. F. Baumshteyn *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 31 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 11, Nov. 1983 p 74-76 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A method of determining the tolerance limits of durability of structural components based on correct statistical procedures is described. The method is illustrated by calculation from the results of tests of standard prismatic specimens with a crack, and gas turbine engine compressor vanes made of 14Kh17N2 steel tested under the same conditions of vibration loading by bending. The experimentally determined durability of the vanes was within the tolerance range determined from calculations done with respect to results of tests of the specimens. Author

N85-24170# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF GAS-TURBINE ENGINE BLOWER IMPELLER VIBRATIONS WITH CHANGE IN ENGINE INTAKE CONDITIONS Abstract Only **c37**
D. S. Yelenevskiy and V. V. Malygin *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 31-32 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 10, Oct. 1983 p 81-85 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Vibrations of low pressure compression impellers in multiple shaft gas turbine engines were studied in stand tests with different intake conditions. The working vanes of the investigated blowers had relatively large linear dimensions compared with the disks, and were equipped with antivibration shroud tips. The test results show that different designs of the engine intake device have a strong influence on the structure of nonuniformity of gasdynamic flow at the engine intake, and also determine the vibration behavior of the blower impellers. Resonant vibrations of the working vanes occur at maximum symmetry of airflow into the engine. Distortions of intake conditions introduced by segmental interceptors increase turbulence in the flow section of the blower, resulting in stochastic vibration response of the blower vanes. The results of studies of the vibration state of the blower in engines of various classes were qualitatively identical, which shows that the patterns observed in this research are general in nature. G.L.C.

N85-24171# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF DIRECTIONAL GYRO PARAMETERS **c35**
V. A. Pavlov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 33-37 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborost. (Leningrad), v. 27, no. 1, Jan. 1984 p 59-62 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A method is discussed for determining the principal design parameters of a directional gyro as a function of the required accuracy of its maintaining a specific direction in interial space. Author

N85-24172# Joint Publications Research Service, Arlington, Va.
DECOMPOSITION IN PROBLEM OF CORRECTING INERTIAL NAVIGATION SYSTEMS Abstract Only **c04**
V. I. Kalenova and V. M. Morozov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekh. Tverd. Tela (Moscow), no. 6, Jun. 1983 p 14-21 Previously announced in IAA as A84-21051 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The study is concerned with the decomposition of problems involving the estimation of the state vector of linear observable systems. In accordance with the approach used here, a system is considered decomposed if the resulting subsystems are not completely independent but related through the measurement vector components or their first derivatives, each subsystem corresponding to its own scalar measurement. Here, the error equations are completely independent. The results obtained are used to construct simple algorithms for the correction of inertial navigation systems on the basis of velocity and position data. V.L. (IAA)

N85-24173# Joint Publications Research Service, Arlington, Va.
QUATERNION ALGORITHMS OF 3-DIMENSIONAL INERTIAL NAVIGATIONAL SYSTEMS Abstract Only **c04**
Yu. N. Chelnokov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 38 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekh. Tverd. Tela (Moscow), no. 6, Jun. 1983 p 14-21 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A three dimensional inertial navigation system is studied, in which three force meters are mounted rigidly to a moving object, generally in a cardan support. Quaternion equations were derived for an azimuth stabilized platform as well as a gyrostabilized platform preserving its orientation with respect to distant stars. The equations are equivalent to equations of a perturbed oscillator for arbitrary motion of the object to the equations of the harmonic oscillator for Kepler motion of the object. Of particular interest is the use of two equations in the article for the solution of an important class of navigational problems in which the distance from the object to the center of the Earth is known as a function of time. Author

N85-24174# Joint Publications Research Service, Arlington, Va.
MOTION OF SATELLITE WITH TOTAL DYNAMIC SYMMETRY AROUND ROTATING ASPHERICAL EARTH Abstract Only **c15**
D. Z. Koyenov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 39 Transl. into ENGLISH from Dokl. Akad. Nauk Tadzh. SSR (Dushanbe, USSR), v. 26, no. 6, Sep. 1983 p 355-357 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The problem of motion of a satellite with complete dynamic symmetry around a rotating aspherical planet was solved, using the method of Lie transformations. Using the expansion of the generating function of transformations and considering trigonometric identities for the Andoyer canonical elements, a shorter and more convenient form of expansion was found that is used to derive expressions for perturbations of selected canonical elements that determine the translational motion of a satellite and rotational motion of the Earth with accuracy of 10 to the 8th power. It is shown that the Delaunay elements characterizing translational motion of a satellite around the Earth undergo considerable perturbations due to the figure of the Earth. B.G.

N85-24175# Joint Publications Research Service, Arlington, Va.
CALCULATING ISOTHERMAL FLOW IN WAKE BEYOND INJECTION ZONE Abstract Only **c34**

N. M. Krutova and T. A. Mityushkina *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 41 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 42-45 Original language doc. was announced in IAA as A84-14258 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

An analysis is made of turbulent flow in the wake of an injection zone on a permeable flat plate. The equations of the boundary layer are solved numericaliy, and mean velocity profiles are obtained. A comparison with experimental data shows that the calculated velocities are somewhat higher than the experimental values. V.L. (IAA)

N85-24176# Joint Publications Research Service, Arlington, Va.
AUTOMATING THE STUDY OF ERROR IN DISCRETE AERODYNAMIC FAIRING DESIGN Abstract Only c05
I. I. Itskovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 41-42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 28-33 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The assignment of a set of coordinates for numerical control of a machine tool to generate an aerodynamic shape was studied. The possibility is studied of automated monitoring of the coordinate error of a gas dynamic fairing by the use of a computer. The mathematical method for estimating the error is based on the theory of linear digital signal filtration. The effectiveness of linear digital filtration was performed during calculation for the production of turbine compressor blades. The error of each internal point on the profile was estimated and coordinate noise characteristics computed. The estimates were used to determine serious errors in coordinates, beyond the statistical distribution. These points were then discarded. The resolution of the digital filter was found to be 0.0001 mm. At least 10 points should be used to get local and statistical estimates of coordinate errors. About 100 points per minute can be computed on a YeS-1022 computer. Author

N85-24177# Joint Publications Research Service, Arlington, Va.
CALCULATING BOUNDARY LAYER ON PROFILE WITH LAMINAR AND TURBULENT FLOW ZONE Abstract Only c34
V. D. Sovershennyy and V. A. Aleksin *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 68-72 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A numerical method is applied to solve partial differential equations allowing direct determination of the influence of the hypothesis of turbulence on the final results when laminar, transition and turbulent flow zones are present on a profile, as well as consideration of the simultaneous influence of a number of factors in the problem. Calculated and experimental data are compared. The system of equations includes equations for discontinuity, equations of motion, energy and state. Author

N85-24178# Joint Publications Research Service, Arlington, Va.
MODEL OF FRICTION BEARING HYDRODYNAMICS Abstract Only c37
S. B. Cherebatskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 73-77 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The following model of the operation of a bearing is analyzed. The pressure in the fluid cannot be measured. The flow of lubricant occurs at a constant temperature. Laminar flow of fluid with full adhesion of the fluid to the walls is studied. In the area where laminar flow is impossible the pressure is assumed to be atmospheric. The variation of pressure as a function of flow rate of lubricant is determined. The basic conclusions can be applied to gas bearings as well. Author

N85-24179# Joint Publications Research Service, Arlington, Va.
PROBLEM OF REDUCTION TO IDEAL TUBE IN EXPERIMENTAL AERODYNAMICS Abstract Only c02
N. N. Yanenko, Yu. Ye. Voskoboynikov, and N. G. Preobrazhenskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 44 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 274, no. 6, Feb. 1984 p 1209-1312 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A linearized statement of the problem of eliminating the spread function (reduction to ideal tube) in measuring the amplitude of pulsations of a turbulent flow is examined. Regularization methods are used to eliminate the distorting influence of the spread function of the aerodynamic tube and to solve the problem of reduction to an ideal tube when investigating the distribution density of amplitude pulsations of a turbulent flow. Author

N85-24180# Joint Publications Research Service, Arlington, Va.
COMPUTATIONS FOR SEGMENTED RADIAL BEARINGS Abstract Only c37
I. Ya. Tokar, I. V. Saychuk, and M. G. Vishnivetskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 46 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 11, Nov. 1983 p 9-11 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

Segmented radial bearings are subject to thermal deformation significantly greater than due to loading, which can be reduced by forced cooling of the working surface better than by oil baths that develop higher temperatures. Prognosis of working characteristics of the cooled segmented radial bearings involves computation of process non-isothermicity in the system. A method was used involving a system of equations for movement, mass and energy describing the flow of viscous incompressible liquid in the lubricating system. Basic bearing characteristics were computed and working surface temperature and heat removal data were generated. Experimental data were obtained for temperatures, pressure, friction, loading and lubricant flow that agreed with computations. Optimal parameters can then be chosen for segmented radial bearings as concerns temperature control. The maximum babbit metal values can be reduced 20 to 25 C for specific loads and heat extraction from the surface can be increased by an additional 5 to 7 C by intensified removal, lubricant channel increase and use of other materials. Author

N85-24181# Joint Publications Research Service, Arlington, Va.
STRENGTH COMPUTATION OF THIN WALLED SHELL BY DISCREET-CONTINUOUS MODEL Abstract Only c39
V. G. Shatayev and A. G. Samartsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 77-82 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

A numerical method is suggested for determining the stress-strain state of a reinforced shell of arbitrary cross section considering elasticity of the ribs. The body is assumed to be divided into sections or compartments, either of which is a set of flat panels, straight stiffening ribs and frame rib structures with finite rigidity in plane and absolute compliance out of plane. A discrete-continuous model is used to describe the stress-strain state, assuming a thin, zero moment skin which accepts only shear stress, its operation in response to perpendicular stresses being computed considering attached strips. The rigidity characteristics of each section are considered to be arbitrary functions of the longitudinal coordinate. The elasticity of the ribs is found to have a significant influence on the stress-strain state of the structure at the point of load application. Author

N85-24182# Joint Publications Research Service, Arlington, Va.
WORK OF AXIAL BEARING UNDER DYNAMIC LOADING Abstract Only c37
Ye. I. Zaretskiy, L. P. Serezhkina, and I. D. Usachev *In its* USSR

Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 49 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 8, Aug. 1983 p 11-12, 14 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

The operation of thrust bearings under transient conditions were performed on a full-scale test-stand installation (thrust disk diameter 580 mm) with bearings having reduced load-bearing capacity. Thermocouples were installed at distances of 4 mm from the load-bearing surface. At loading rates exceeding 100 tf/s, the temperature measured by the thermocouple lags far behind the actual temperature at the friction surface. Triple dynamic loading of the bearing by identical forces at equal time intervals was modeled on the test stand. The results of the experiments indicated that under dynamic operating conditions there is no unambiguous variation between the temperature of the bearing and the load at any moment in time. Bearing temperature therefore cannot be considered as an on-line indicator of thrust bearing reliability.
Author

N85-24183# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
26 Apr. 1985 102 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-013) Avail: NTIS HC A06/MF A01

A broad overview of recent European technological advancements and the their applications is presented. Topics presented include: (1) advanced materials; (2) aerospace; (3) biotechnology; (4) civil aviation; (5) computers; (6) factory automation; (7) scientific and industrial policy; and (8) technology transfer. For individual titles, see N85-24184 through N85-24188.

N85-24184# Joint Publications Research Service, Arlington, Va.
GIGANTIC LITHIUM DEPOSIT DISCOVERED IN FRANCE c43
Jean-Francois Rouge *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 1-3 refs Transl. into ENGLISH from Liberation (Paris), 19 Feb. 1985 p 17 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

Geologists suspect that a huge vein of lithium and other so-called metals of the future hide beneath the ground around Montlucon, in Allier. But their exploitation requires enormous investments, about which neither the government nor industrialists are very enthusiastic. There are those who already view this deposit in the Massif Central as one of France's great mining fortunes. A quasi-inexhaustible source of tin and all the rare strategic metals, indispensible for the alloys of the future demanded by the space or electronics industries: tungsten, lithium, tantalum, or beryllium.
G.L.C.

N85-24185# Joint Publications Research Service, Arlington, Va.
IGNITION, SEPARATION OF BOOSTERS, STAGES IN ARIANE 3 c20
Goetz Wange *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 5-7 refs Transl. into ENGLISH from Flugrevue (Munich), Dec. 1984 p 27 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

Ariane 3 fortified with two additional solid-fuel rockets has passed its second verification test. The European booster rocket took off on November 10 from the launching pad in Kourou with the satellites SPACENET and MARECS-B2.
G.L.C.

N85-24186# Joint Publications Research Service, Arlington, Va.
A 320 TO HAVE COMBINED AUTOMATIC PILOT, FLIGHT CONTROL SYSTEM c08
H. Prandenc *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 51-52 refs (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

An innovative machine in more ways than one, the A 320 will be the first airliner equipped with a combined automatic pilot and flight control system [FMGS].
G.L.C.

N85-24187# Joint Publications Research Service, Arlington, Va.
FRENCH WORK TOWARD FLEXIBLE SOFTWARE WORKSHOPS c61
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 55-61 refs Transl. into ENGLISH from Le Nouvel Automatisme (Paris), Oct. 1984 p 22-25 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

The software workshop of the future, composed of specialized machine tools--data base machines, language machines, object machines--and capable of generating software which can be used on some target machine are coming up on the horizon. This flexibility will be necessary to adapt such a software workshop to the great diversity of situations and of production in the field of program development.
G.L.C.

N85-24188# Joint Publications Research Service, Arlington, Va.
MBB AUTOMATES AIRCRAFT PRODUCTION IN MANY FRG FACILITIES c01
Hellmut Penner *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 65-67 refs Transl. into ENGLISH from Flugrevue (Munich), Dec. 1984 p 66-70 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

An overview of automation processes and procedures in the German Aircraft Industry is presented.
G.L.C.

N85-24189# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
16 Apr. 1985 66 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-015) Avail: NTIS HC A04/MF A01

Progress in Eastern European science and technology is reported. Topics discussed include: theoretical innovations in Tokamak systems, developments in robotics, electronic measurements and control devices, and CAD/CAM support for microprocessor development. For individual titles, see N85-24190 through N85-24193.

N85-24190# Joint Publications Research Service, Arlington, Va.
DESIGN, THEORETICAL INNOVATIONS IN TOKAMAKS SYSTEMS c75
Michal Strida *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 1-3 refs Transl. into ENGLISH from Rude Pravo (Prague), 27 Feb. 1985 p 4 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

The redesign of the Tokamak TM1 is described. The basis for the redesign was the setting up a new vacuum toroid chamber at the tokamak, and additional relevant adaptations. It takes a relatively long time to reach the correct Tokamak plasma temperature at several million degrees. Thermal seasoning of plasma lasts for many months. Tokamak theory and its study on linear transformation high-frequency waves in nonhomogeneous plasma, is outlined. It is shown that in the high frequency heating of plasma an angle exists, given by the size of the magnetic field, under which millimeter waves penetrate into the plasma. This makes it a more effective heating method.
E.A.K.

N85-24191# Joint Publications Research Service, Arlington, Va.
PLANS, DEVELOPMENTS IN ROBOTICS c37
Kristof G. Kocsis *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 11-16 refs Transl. into ENGLISH from Magiap Hirlap (Budapest), 26 Feb. p 7 (For primary document see N85-24189 14-31)
Avail: NTIS HC A06/MF A01

Developments in robotics are described. Domestic manufacture is characterized in large part by isolated developments. In the mid 1970's, the moderately capable Robi was built. Then the FER manipulators were developed and made into an automatic picture tube loading device. A new profile for automatic devices to test and check integrated circuits is being built.

N85-24192# Joint Publications Research Service, Arlington, Va.
NEW ELECTRONIC MEASUREMENT, CONTROL DEVICES c35
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 37-41 refs Transl. into ENGLISH from Pomiary Automatyka Kontrola (Warsaw), no. 11, Nov. 1984 p 342-346 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

The electronic control device serves to measure the capacitance of the loss factor tg delta and the leakage current of tantalum and electrolytic capacitors. During the measurement of the leakage current, the capacitor can be polarized from an internal source with constant voltage regulated continuously from 0 to 100 V, or with a voltage of up to 500 V from an external source. The instrument has a system signalizing the loading state of the capacitor and a system for unloading it. The meter has two readout fields with LED display indicators: 3 and 5-digit for measuring the capacitance and the leakage current; 3-digit for measurement of tg delta and polarization intensity. The choice of the range for capacitance measurement can be done manually or from outside. The capacitance measurement is performed by the four-point technique in a serial replacement system. The meter with the corresponding interface block can operate in measurement systems according to IEC/ISP II standard. E.A.K.

N85-24193# Joint Publications Research Service, Arlington, Va.
RESEARCH ON CAD/CAM SUPPORT FOR MICROPROCESSOR DEVELOPMENT SURVEYED c61
Wlodzimierz Soinski *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 42-53 refs Transl. into ENGLISH from Przeglad Morski (Gydnia), no. 12, Dec. 1984 p 58-66 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

The current state of development of microprocessor technology is described. The development of applications of microprocessors in products and systems is examined. The applications need for hardware that make the development possible is described. The tools, materials and design are outlined. The tools are the oscilloscope analyzer and the implementation of CAD/CAM systems to cross software. The spectrum of tools of different degrees of complexity from built-in system elements to selected CAD/CAM systems are considered. E.A.K.

N85-24380# Toba Merchant Marine Coll. (Japan). Dept. of Oceanography.
THE TRANSPACIFIC EXPERIMENTAL SAILING BY YASEIGO 3
Hiroaki Ochiai, Shoji Takeuchi (Remote Sensing Technology Center of Japan), Haruki Kadokawa (Society of Ancient Pacific Cultures), Kazunobu Fujimoto (Society of Ancient Pacific Cultures), and Muneyuki Matsui (Society of Ancient Pacific Cultures) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 153-158 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24381# National Museum of Natural History, Paris (France). Lab. d'Oceanography Physique.
THE ARGOS CONTRIBUTION TO THE SUCCESSFUL DREDGING OF A DEEP MOORED CURRENT METER
J. Gonella and B. Ollivier (ORSTOM) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 159-164 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-24194 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
DESIGN AND MEASURED PERFORMANCE OF A BROADBAND ARCHIMEDES SPIRAL ANTENNA
D. E. Baker and C. A. vanderNeut 1983 9 p refs
(R-NIAS-22; K-1) Copyright. Avail: Issuing Activity

The design and measured performance of an Archimedes spiral antenna with a frequency bandwidth of at least 40:1 is described. The VSWR is better than 2:1 and excellent circularly polarized patterns are achieved over the entire frequency band. E.A.K.

N85-24195 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
MICROSTRIP COMB ARRAY DESIGN
C. A. vanderNeut 1983 10 p refs
(R-NIAS-24; M-1) Copyright. Avail: Issuing Activity

The design of X-band microstrip comb arrays is discussed and measured patterns and performance is given for a 9 x 9 element and a 13 x 13 element array. It is shown how such an array may be fed through a waveguide to microstrip transformer.
Author

N85-24196 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
A COMPACT, APERTURE-MATCHED, BALANCED TRANSMISSION LINE ANTENNA
D. E. Baker and C. A. vanderNeut 1983 9 p refs
(R-NIAS-28; Z-1) Copyright. Avail: Issuing Activity

A novel balanced transmission line antenna where the maximum separation between the two conductors is only a fraction of a wavelength at the lowest operating frequency is described. The balanced transmission line is formed by exponentially extending the ridges of a double-ridged waveguide. The poor VSWR and patterns caused by reflections from the tips of the ridge extensions are improved by a combination of aperture matching and the use of microwave absorber. Measured VSWR, radiation pattern and gain data are presented for this compact, broadband antenna over the 2 to 11 GHz frequency range. E.A.K.

N85-24197*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FH/MFSK PERFORMANCE IN MULTITONE JAMMING
Barry K. Levitt 15 Jan. 1985 52 p refs
(Contract NAS7-918)
(NASA-CR-175667; JPL-PUBL-84-90; NAS 1.26:175667) Avail: NTIS HC A04/MF A01 CSCL 20N

The performance of frequency-hopped (FH) M-ary frequency-shift keyed (MFSK) signals in partial-band noise was analyzed in the open literature. The previous research is extended to the usually more effective class of multitone jamming. Some objectives researched are: (1) To categorize several different multitone jamming strategies; (2) To analyze the performance of FH/MSFK signaling, both uncoded with diversity, assuming a noncoherent energy detection metric with linear combining and perfect jamming state side information, in the presence of worst case interference for each of these multitone categories; and (3) To compare the effectiveness of the various multitone jamming techniques, and contrast the results with the partial band noise jamming case.
Author

N85-24198*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTRODUCTION TO THE SPACE PHYSICS ANALYSIS NETWORK (SPAN)
James L. Green, ed. and David J. Peters, ed. (Alabama Univ., Huntsville) Apr. 1985 38 p refs
(NASA-TM-86499; NAS 1.15:86499) Avail: NTIS HC A03/MF A01 CSCL 17B

The Space Physics Analysis Network or SPAN is emerging as a viable method for solving an immediate communication problem for the space scientist. SPAN provides low-rate communication capability with co-investigators and colleagues, and access to

space science data bases and computational facilities. The SPAN utilizes up-to-date hardware and software for computer-to-computer communications allowing binary file transfer and remote log-on capability to over 25 nationwide space science computer systems. SPAN is not discipline or mission dependent with participation from scientists in such fields as magnetospheric, ionospheric, planetary, and solar physics. Basic information on the network and its use are provided. It is anticipated that SPAN will grow rapidly over the next few years, not only from the standpoint of more network nodes, but as scientists become more proficient in the use of telescience, more capability will be needed to satisfy the demands. Author

N85-24199# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
PRIME-FOCUS PARABOLIC REFLECTOR ANTENNA: THEORY AND MEASUREMENT
D. A. McNamara and D. E. Baker [1984] 10 p refs
(R-NIAS-20; C-1) Avail: NTIS HC A02/MF A01

Some numerical techniques used to compute the patterns of prime focus reflector antennas are reviewed. The design of a front fed, axi-symmetric antenna using a simple TE10 horn feed is described. The measured patterns are compared to the predicted patterns and various discrepancies are discussed. Measurements show that comparatively low sidelobes (-28 dB) can be very rapidly degraded by moving the waveguide run away from one of the struts and then running it as a gooseneck feed from the apex of the reflector. Author

N85-24200# Department of the Air Force, Washington, D.C.
TROPOSPHERIC SCATTER COMMUNICATION SYSTEM HAVING ANGLE DIVERSITY Patent Application
P. D. Kaplan, inventor (to Air Force) Filed 10 Jan. 1984 11 p
(AD-D011448; US-Patent-Appl-SN-569644) Avail: NTIS HC A02/MF A01 CSCL 17/2

A tropospheric scatter communication system provides diverse angle transmission paths which may be utilized alone or in conjunction with frequency and/or other known diversity system arrangements for improved performance. The diverse angle transmission paths are routed through sum and difference monopulse beams displaced in azimuth. Author (GRA)

N85-24201# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
BASIC EMC (ELECTROMAGNETIC COMPATIBILITY) TECHNOLOGY ADVANCEMENT FOR C3 SYSTEMS. VOLUME 4E: MODELING OF TRANSMISSION LINES. A COMPARISON OF LUMPED-CIRCUIT ITERATIVE MODELS AND THE TRANSMISSION LINE MODEL Final Report, Sep. 1982 - Dec. 1983
W. W. Everett, III and C. R. Paul Aug. 1984 149 p
(Contract F30602-81-C-0062)
(AD-A150652; RADC-TR-82-286-Vol-4E) Avail: NTIS HC A07/MF A01 CSCL 20/3

A comparison between the predictions of various lumped-circuit iterative models of transmission lines and that of the transmission line model is given for both the two and three-conductor cases. For frequencies such that the line length is approximately 1/10 of a wavelength or less one section of the lumped-circuit models yield predictions which are within +3dB of the transmission line model predictions, and which are essentially independent of the value of load impedance. For frequencies where the line length is greater than approximately 1/10 of a wavelength, more than one section of the lumped models must be used to yield accurate predictions, but the prediction accuracy may be significantly effected by the load impedance value. The range of accurate predictions (in terms of electrical length) may be increased by adding more sections of a lumped-circuit model, but this range increases in a nonlinear fashion. Because of this nonlinear relationship, it is difficult to find a satisfactory method for estimating the number of sections of a particular lumped-circuit model that must be used in order to obtain a desired range of accurate predictions. GRA

N85-24202# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACCURATE BASELINE DETERMINATION BY RADIO INTERFEROMETRY ON NAVSTAR GPS SATELLITE TRANSMISSIONS Final Report, Apr. 1980 - Jun. 1982
R. L. Greenspan, A. Ng, J. Przyjemski, J. Veale, and C. C. Counselman, III 15 Jun. 1984 117 p
(Contract F19628-80-C-0040)
(AD-A150681; CSDL-R-1719; AFGL-TR-84-0156) Avail: NTIS HC A06/MF A01 CSCL 17/2

The vector components of several baselines shorter than 100 meters have been measured by interferometric processing of NAVSTAR GPS satellite C/A-code broadcasts to an accuracy better than one centimeter, and a repeatability on the order of a few millimeters. Interferometric observables were extracted by two processing schemes. The first involved broadband cross correlation of the modulated GPS signals received by the antennas that define the unknown baselines. The second approach uses GPS receivers at each antenna to reconstruct the satellite carrier from which phase differences can be measured. In both cases the interferometric baseline determinations were compared in a double-blind test with a conventional survey that was believed to be accurate to 2mm (one-sigma) and 3 arcseconds. Multipath was shown to be a significant effect only to the extent that reflecting structures might block the visibility of useful satellite signals. At the present time, the limit on extending the technique to precisely measure baselines exceeding 100 km is uncertainty in GPS satellite ephemerides. For baselines of intermediate length, the measurement performance is limited by uncertainties in tropospheric propagation delays. The results of the experiments plus trends toward miniaturizing GPS equipment complete the demonstration that short baselines can be measured to subcentimeter accuracy using highly portable equipment. GRA

N85-24203# Naval Aerospace Medical Research Lab., Pensacola, Fla.
INTERFERENCE EFFECTS OF VOCALIZATION ON DUAL TASK PERFORMANCE Interim Report
J. M. Owens, L. S. Goodman, and M. J. Pianka Sep. 1984 17 p
(WR0-2410)
(AD-A150687; NAMRL-1309) Avail: NTIS HC A02/MF A01 CSCL 17/2

Voice command and control systems have been proposed as a potential means of off-loading the typically overburdened visual information processing system. However, prior to introducing novel human-machine interfacing technologies in high workload environments, consideration must be given to the integration of the new technologists within existing task structures to ensure that no new sources of workload or interference are systematically introduced. This study examined the use of voice interactive systems technology in the joint performance of two cognitive information processing tasks requiring continuous memory and choice reaction wherein a basis for intertask interference might be expected. Stimuli for the continuous memory task were presented aurally and either voice or keyboard responding was required in the choice reaction task. Performance was significantly degraded in each task when voice responding was required in the choice reaction time task. Performance degradation was evident in higher error scores for both the choice reaction and continuous memory tasks. Performance decrements observed under conditions of high intertask stimulus similarity were not statistically significant. The results signal the need to consider further the task requirements for verbal short-term memory when applying speech technology in multitask environments. GRA

N85-24204# Naval Postgraduate School, Monterey, Calif.
AN EXAMINATION OF SIGNAL-TO-NOISE ENHANCEMENT AT THE EDZELL CDAA (CIRCULAR DISPOSED ANTENNA ARRAY)
W. R. Vincent, S. Jauregui, Jr., J. M. ODwyer, M. D. Henry, and L. J. Hume 31 Aug. 1984 47 p
(AD-A150708; NPS-62-84-063) Avail: NTIS HC A03/MF A01 CSCL 17/2

A comprehensive survey was made of factors that might yield

an increase in signal-to-noise performance of the Edzell circular disposed antenna array including the improved knowledge and control of internal site and system generated noise, external noise from nearby sources, external noise from distant sources, system generated spurious noise and parasitic oscillations, dynamic range limitations of the RF distribution system, and noise entering or leaving the ground system. The impact of each of the above factors on total site performance was examined in order to better understand the benefits that could be realized from various site improvements. Extensive measurements were made of signals and noise at several points in the RF distribution system. Any factor that limited signal-to-noise in the RF distribution system was examined. Author (GRA)

N85-24205# Illinois Univ., Urbana. Engineering-Psychology Research Lab.
MULTIPLE RESOURCES AND DISPLAY FORMATTING: THE IMPLICATIONS OF TASK INTEGRATION IN A SIMULATED AIR TRAFFIC CONTROL TASK
C. D. Wickens, B. Goettl, and D. Boles Dec. 1984 18 p
(Contract N00014-79-C-0658)
(AD-A150713; EPL-84-5/ONR-84-4) Avail: NTIS HC A02/MF A01 CSCL 17/2

Two experiments are reported which test the hypothesis that multiple sources of displayed information should be presented to common rather than separate resources when those sources must be integrated with a single mental model of the task. One experiment requires subjects to integrate horizontal and vertical information in a spatially presented air traffic control task. In support of the hypothesis, performance was best when both sources were presented visually, rather than bimodally. In a control experiment when the altitude and horizontal information did not need to be integrated, the performance advantage to intramodel display disappears. In a separate experiment using a digital display of the aircraft position information, no evidence for better processing of the information to be integrated within the visual modality was obtained. Author (GRA)

N85-24206# Naval Postgraduate School, Monterey, Calif.
NOISE CANCELLATION USING ADAPTIVE ARRAYS M.S. Thesis
C. G. Manikas Jun. 1984 71 p
(AD-A150721) Avail: NTIS HC A04/MF A01 CSCL 09/5

All known adaptive beamformers utilize some form of automatic minimization of the mean square error. High adaption rates though, exhibit a signal cancellation phenomenon leading to self-jamming by the adaptive antennas. This effect results from adaptive interaction between signal and interference (i.e., jammer) inputs simultaneously received by an adaptive antenna. This thesis investigates various existing ways of adaptive beamforming for noise cancelling, and signal enhancement from simple Adaptive Noise Cancellers to Hard Constraint Adaptive Beamformers. GRA

N85-24207# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPATIAL ACQUISITION ALGORITHMS AND SYSTEMS FOR INTERSATELLITE OPTICAL COMMUNICATION LINKS
P. VanHove and V. W. S. Chan Hanscom AFB, Mass. ESD 27 Nov. 1984 126 p
(Contract F19628-85-C-0002)
(AD-A150794; TR-667; ESD-TR-84-016) Avail: NTIS HC A07/MF A01 CSCL 17/2

Spatial acquisition strategies and technologies are analyzed for optical communication systems. Theoretical analysis is followed by examples and comparisons to aid system design. Examples are given for state-of-the-art technology appropriate for space applications. GRA

N85-24208# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
BASIC EMC (ELECTROMAGNETIC COMPATIBILITY) TECHNOLOGY ADVANCEMENT FOR C3 SYSTEMS: MODEL REVISION FOR IEMCAP (INTRASYSTEM ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM) Final Report, Sep. 1982 - Dec. 1983
R. P. Clayton Oct. 1984 169 p
(Contract F30602-81-C-0062)
(AD-A150795; RADC-TR-82-286-Vol-5) Avail: NTIS HC A08/MF A01 CSCL 09/3

This report documents suggested model and code revisions for the wire-to-wire and field-to-wire coupling subroutines in the Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). The suggested revisions are to improve model predictions, remove unnecessary code, and modularize the subroutines. An assessment of the advisibility of including models for system perturbations (cable clamps, ribs, bulkheads, etc.) is also given. Originator supplied keywords include: IEMCAP; wire-to-wire; field-to-wire; crosstalk; electromagnetic compatibility; EMC modeling. GRA

N85-24209# Imperial Coll. of Science and Technology, London (England). Dept. of Electrical Engineering.
MULTIDIMENSIONAL DIGITAL SIGNAL PROCESSING Interim Report
T. A. Lanfear and A. G. Constantinides Jun. 1984 27 p
(Contract DAJA45-84-C-0025)
(AD-A150833; IR-1; IR-2) Avail: NTIS HC A03/MF A01 CSCL 09/3

The computer program SIMUL is intended to simulate the ALPS system architecture at a high level so as to answer such questions as: is a signal processing application feasible with a particular hardware configuration?; how fast can the processing be performed?; will the system degrade gracefully if some of the resources fail?; what is the effect upon system performance of changes to details such as the number of resources available, the execution time of a resource etc. This document should be read in conjunction with previous documentation for ALPS. The program takes as input data the following information: the number of nodes in the signal flow graph, the number of types of resources, the number of data busses, the time to transfer a block of data from one resource to another, the signal flow graph connectivity and edge prioritization in the form of an adjacency matrix, the number of each type of resource, the execution time of each resource and the type of resource associated with each graph node. GRA

N85-24210# Naval Ocean Systems Center, San Diego, Calif.
RESEARCH NEEDS FOR ARTIFICIAL INTELLIGENCE APPLICATIONS IN SUPPORT OF C3 (COMMAND, CONTROL, AND COMMUNICATION) Interim Report
R. A. Dillard Dec. 1984 25 p
(AD-A150867; NOSC/TR-1009) Avail: NTIS HC A02/MF A01 CSCL 17/2

Earlier investigations of Navy data fusion problems and techniques are extended into three other areas. The first investigations, from a single site and platform, are extended to a global network of systems. The problem of sharing information among subsystems of a command and control system is expanded to that of sharing information of mutual interest with other units and battlegroups. The next investigation concerns a reconstruction and post-analysis system. The reconstruction process is simply data fusion after all data are in. After reconstruction, artificial intelligence (AI) techniques may be used to interpret and help analyze the event records. The last topic concerns information storage and retrieval in novel mediums. Throughout these discussions, the main emphasis is on the application of AI tools. GRA

N85-24211# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPARATIVE ARCHITECTURES FOR A MULTIPLE FUNCTION SPEECH PROCESSOR
E. Singer 18 Dec. 1984 50 p
(Contract F19628-85-C-0002)
(AD-A150873; TR-712; ESD-TR-84-283) Avail: NTIS HC A03/MF A01 CSCL 17/2

A study of the feasibility of realizing a compact, multiple function speech processor using digital signal processing integrated circuits is presented in this report. The processor is required to accommo-

date a 2400 bps Linear Predictive (LPC-10) vocoder, a 9600 bps Adaptive Predictive (APC) vocoder, and wireline modems at the corresponding data rates. Architectures employing the Texas Instruments TMS32010 and the Fujitsu MB8764 digital signal processing integrated circuits appeared to be most likely to achieve this goal. Since the current generation of DSP chips does not permit the algorithms to be contained in a processor simultaneously, the study was confined to the realization of each of the functions individually using replaceable ROMs. A proposed architecture based on the TMS32010 includes automatic address generation hardware to permit fast processing of large blocks of data stored in external memory. Although specifically tailored to implement the Adaptive Predictive Coding algorithm, the processor appears to be a likely candidate for the multiple function task as well. An architecture based on the MB8764 includes special purpose hardware which adds an interrupt capability to the device. A detailed study of the Fujitsu-based design indicates that a compact realization of the multiple function processor can be realized using commercially available hardware and a custom IC fabricated using in-house design tools. GRA

N85-24212# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

ANALYTICAL STUDIES AND EXPERIMENTAL MEASUREMENTS OF AMPLITUDE AND PHASE OF NEAR-FIELD RANGE ANTENNA PROBES Final Report, 1 May 1983 - 30 Jun. 1984

A. W. Biggs May 1984 19 p
(Grant AF-AFOSR-0190-83)
(AD-A150922; CRINC/RSL-TR-6190-F; AFOSR-85-0119TR) Avail: NTIS HC A02/MF A01 CSCL 20/14

The effects of probe antenna errors in the basic theory of probe compensated near-field measurements for arbitrary antenna are presented. The study encompassed: (1) measurements made in the near-field of the arbitrary test antenna; (2) directional effects of probe antennas on reception by test antennas; and (3) computed patterns of test antennas that span a solid angle instead of one or two principal plane cuts. Results of experimental measurements conducted are reported with both advantages and disadvantages discussed. Fields from the test and probe antennas are expressed in elementary plane wave expansions and the Lorentz reciptrocity theorem is used to calculate the output. GRA

N85-24213# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.

INFLUENCE SCATTERING AND Q IN THE LITHOSPHERE Final Technical Report, 15 Nov. 1982 - 14 Nov. 1984

A. M. Dainty, R. M. Duckworth, and A. Tie 14 Nov. 1984 82 p
(Grant AF-AFOSR-0037-83; ARPA Order 4397)
(AD-A150939; AFOSR-85-0101TR) Avail: NTIS HC A05/MF A01 CSCL 17/2

This project examined the contribution of scattering to the attenuation of short pulses within the crust. Coda decay and excitation for local events were examined at Mammoth Lakes and Morgan Hill, Calif., Monticello, SC; and New Brunswick, Canada, in the frequency range 3-50 Hz. For short times (less than 10 seconds), the total turbidity determined from coda decay was about 0.1/km for all regions, applying a magnitude bias of 0.2 in m sub b if 10 km of such material is traversed. Since the total turbidity is independent of frequency, implying geometrical scattering, this would not be detectable by spectral radio methods. The backscattering turbidity determined from coda excitation at short times indicates strong scattering in the upper crust, especially for frequencies in the 3-10 Hz range. At times longer than 10-15 seconds for the codas from the eastern North American regions, Monticello and New Brunswick, the coda energy appeared to be channeled into a horizontally propagating mode such as Lg. The total turbidity for this portion of the coda was lower than for the short codas, about 0.01/km, indicating less scattering, a result born out by the backscattering turbidity. Codas from California, however, did not show this phenomenon, indicating either that this mode is not present or that it is more strongly scattered. This result indicates that attenuation for Lg can be estimated from the coda after 10 seconds, as proposed by other workers. GRA

N85-24214# Singer Co., Sunnyvale, Calif. Link Flight Simulation Div.

SYNTHETIC APERTURE RADAR SIMULATION STUDY Final Report, May 1983 - Mar. 1984

R. L. Peters Mar. 1984 188 p Original contains color illustrations
(Contract N61339-83-C-0068)
(AD-A151000; NAVTRAEQUIPC-83-C-0068) Avail: NTIS HC A09/MF A01 CSCL 17/9

This study develops the theory of the Doppler effect and synthetic aperture radar. The similarity between SAR and a lens is made clear. The characteristics of SAR, such as iso-Doppler mapping, focused array, range walk and rotation are explored in this report. Algorithms for simulation are provided, SAR anomalies, such as moving targets, footprint, Doppler elevation mapping, and multilook are discussed. A chapter is devoted to elevation and planimetric data bases. In addition, sixteen pictures of SAR images from Hughes Aircraft, as well as nineteen emulation SAR images are included in this publication. Author (GRA)

N85-24215# Department of the Air Force, Washington, D.C.

SECURE DIGITAL SPEECH COMMUNICATION Patent Application

G. Benke, inventor (to Air Force) Filed 26 Jun. 1984 78 p
(AD-D011572; US-Patent-Appl-SN-624567) Avail: NTIS HC A05/MF A01 CSCL 09/4

This invention relates to a secure digital speech communication system, and more particularly to waveform coding with digital samples. A novel form of waveform coding is used, designing a Critical Point Coder (CPC). It operates by transmitting only those points in a waveform which are significant for defining its overall structure. The receiver reconstructs the missing points in the waveform using some sort of approximating interpolation. The CPC uses a new approach to waveform coding. Rather than transmitting information about each sample as other waveform coders, the CPC transmits information for only samples deemed critical to high quality reconstruction. The four major functions performed by the CPC are (1) detecting which samples are critical, called critical points: (2) quantizing the vectors which are formed between successive critical points: (3) dealing with the non-uniform bit rate since critical points do not occur regularly: and (4) reconstructing the waveform between the endpoints of the quantized vectors. GRA

N85-24216# Physics Lab. RVO-TNO, The Hague (Netherlands). Researchgroep: Telecommunicatie.

AN ERROR GENERATOR TO SUPPORT THE TRIALS OF THE ZODIAC PROTOTYPE SYSTEM

C. Eberwijn and F. C. Immers 1984 21 p In DUTCH; ENGLISH summary
(Contract A82/KL/060)
(PHL-1984-71; TDCK-79740) Avail: NTIS HC A02/MF A01

An error generator was developed in the framework of the ZODIAC project for the modernization of a raster linking system. The generator can be used in ZODIAC links and in the laboratory to generate adjustable quantities of pseudo-randomly distributed errors. The resulting bit error rates (BER) cover the range 0.1 to 0.00001. In this domain, 7 BER are adjustable with an accuracy $> 5\%$. Author (ESA)

N85-24217 British Broadcasting Corp., Kingswood (England). Engineering Div.

FURTHER DEVELOPMENTS OF CCD LINE ARRAY TELECINE

I. Childs Feb. 1985 29 p refs
(BBC-RD-1985/3) Avail: BBC, Kingswood Warren, Tadbury, Surrey, Engl.

Advances in technology relevant to the use of solid-state line-array sensors in telecine applications are discussed. The improvements in performance of recent generations of line-array sensors were examined, together with the further benefits obtainable by using improved signal processing. The use of digital storage as a necessary part of a line-array telecine also opens up additional capabilities for facilities such as variable-speed running

and the concealment of dirt and scratches. Both of these features are considered in this report. E.A.K.

N85-23815*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALTERNATIVES FOR SATELLITE SOUND BROADCAST SYSTEMS AT HF AND VHF
Bruce E. LeRoy *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 27-37 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23819*# Naval Research Lab., Washington, D. C. Space Sensing Applications Branch.
LOW-FREQUENCY MICROWAVE RADIOMETER FOR N-ROSS
J. P. Hollinger and R. C. Lo *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 87-95 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23821*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADVANCED 2-FREQUENCY OCEAN SENSING RADAR USING HIGH RESOLUTION ANTENNA BEAMS
D. E. Weissman (Hofstra Univ., Hempstead, N.Y.) and J. W. Johnson *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 109-115 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23822*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
QUASAT: AN ORBITING VERY LONG BASELINE INTERFEROMETER PROGRAM USING LARGE SPACE ANTENNA SYSTEMS
J. F. Jordan, R. E. Freeland, G. S. Levy, and D. L. Potts *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 117-125 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23828*# TRW Electronics and Defense Sector, Redondo Beach, Calif.
ANTENNA TECHNOLOGY FOR QUASAT APPLICATION
John S. Archer and William B. Palmer *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 251-270 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23851*# Ohio State Univ., Columbus.
APPLICATION OF MODERN APERTURE INTEGRATION (AI) AND GEOMETRICAL THEORY OF DIFFRACTION (GTD) TECHNIQUES FOR ANALYSIS OF LARGE REFLECTOR ANTENNAS
Roger C. Rudduck *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 675-691 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-23852*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FEED SYSTEM DESIGN CONSIDERATIONS FOR LARGE SPACE ANTENNA SYSTEMS. PART 1: MULTIPLE APERTURES WITH NON-OVERLAPPING FEEDS
M. C. Bailey *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 693-702 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-23853*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FEED SYSTEM DESIGN CONSIDERATIONS FOR LARGE SPACE ANTENNA SYSTEMS. PART 2: SINGLE APERTURE WITH OVERLAPPING FEEDS
V. Jamnejad *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 703-713 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-23854*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIFFRACTION ANALYSIS OF MESH DEPLOYABLE REFLECTOR ANTENNAS
Y. Rahmat-Samii *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 715-736 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-23855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETERMINATION OF ELECTROMAGNETIC PROPERTIES OF MESH MATERIAL USING ADVANCED RADIOMETER TECHNIQUES
R. F. Arrington and H. J. C. Blume *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 737-756 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-23872# Electronique Marcel Dassault, St. Cloud (France).
THE ARGOS PLATFORM TRANSMITTER TERMINALS (PTTS)
Michel Peberay *In* CNES Data Collection and Platform Location by Satellite 1980 8 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23873# Compagnie pour l'Electronique, l'Informatique et les Systemes, Blagnac (France).
THE ARGOS VHF DIRECT READOUT MINI-STATION AND CML-80-MP DATA COLLECTION PLATFORM TRANSMITTER TERMINALS (PTTS)
Didier Bernadet *In* CNES Data Collection and Platform Location by Satellite 1980 6 p (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23886# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).
ARGOS VHF DIRECT READOUT MINI-STATION
Alain Monier *In* CNES Data Collection and Platform Location by Satellite 1981 5 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-24353# Toyo Communication Equipment Co. Ltd., Kanagawa (Japan).
THE DEVELOPMENT OF PLATFORM TRANSMITTER TERMINAL (PTT) AND ITS APPLICATION FOR DRIFTING BUOYS
Masayuki Tsutsumi *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 9 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24376# Rijkswaterstaat, The Hague (Netherlands). Data Processing Div.
THE ARGOS COMMUNICATIONS PERFORMANCE TRIALS
Jan Looyen *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 113-123 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24390# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).
DIRECT READOUT AND DISSEMINATION OF RESULTS USING ARGOS KEYPAD TERMINALS
D. Bernadet *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 227-233 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24393# National Environmental Satellite Service, Washington, D. C.
GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE DATA COLLECTION SYSTEM
Russell Koffler *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 9 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24394# National Environmental Satellite Service, Washington, D. C. Information Processing Div.
NOAA'S ROLE IN SUPPORT OF SERVICE ARGOS
A. Shaw *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 7 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24395# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
SERVICE ARGOS TECHNICAL REPORT AND IMPROVEMENT
A. Goasguen *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 23 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24407# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France). Centre de Gros.
DATA TRANSMISSION USING ARGOS KEYPAD PLATFORM TRANSMITTER TERMINALS (PTT)
Didier Bernadet *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 5 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24418# Atmospheric Environment Service, Downsview (Ontario).
OVERVIEW OF DATA PROCESSING AT AES LOCAL USER TERMINALS
W. Hume and H. Kagawa *In* CNES Data Collection and Platform Location by Satellite 1984 6 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24420*# Science Systems and Applications, Inc., Seabrook, Md.
SOME METHODS OF COMPUTING PLATFORM TRANSMITTER TERMINAL LOCATION ESTIMATES
C. M. Hoisington *In* CNES Data Collection and Platform Location by Satellite 1984 14 p refs Sponsored by NASA. Goddard Space Flight Center (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24468# Joint Publications Research Service, Arlington, Va.
FORESHORTENED SHORT-WAVE SCATTERING ON ARTIFICIAL IONOSPHERIC INHOMOGENEITIES Abstract Only
V. Y. Vovk, L. M. Yerkhimov, O. I. Maksimenko, E. Y. Mityakova, N. A. Mityakov, N. M. Voguta, B. Y. Nekrasov, V. P. Uryadov, A. V. Shirochkov, I. A. Shumilov et al *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 41-42 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 503-504 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24473# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF ANISOTROPY OF SCATTERING OF RADAR SIGNALS BY CLOUDS AND PRECIPITATION Abstract Only
N. N. Badulin, A. P. Batsula, Y. B. Kulsheneva, S. P. Lukyanov, Y. V. Masalov, and V. N. Tatarinov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 45 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 505-510 Original language document announced as 84A-42547 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24474# Joint Publications Research Service, Arlington, Va.
DETERMINING ATMOSPHERE MOISTURE CONTENT FROM DIFFERENCES IN TWO-FREQUENCY MICROWAVE RADIATION MEASUREMENTS Abstract Only
V. A. Rassadovskiy and A. V. Troitskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 45-46 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 566-574 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24487# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELDS MIGRATION METHOD Abstract Only
M. S. Zhdanov and M. A. Frenkel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 60-61 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 60-74 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24488# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF DIRECTIONAL MAGNETOTELLURIC SOUNDINGS BY ANALYTICAL CONTINUATION METHOD Abstract Only
D. N. Chetayev, A. N. Osmakov, M. V. Matveichev, and A. K. Chernyshev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 61-62 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 75-82 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24621# Radio Research Labs., Tokyo (Japan).
VLF EMISSIONS OBSERVED BY ISIS SATELLITES DURING THE IMS
T. Ondoh, S. Watanabe, and Y. Nakamura *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 525-528 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24622*# Kyoto Univ. (Japan). Dept. of Electronical Engineering.
VLF WAVE-PARTICLE INTERACTION EXPERIMENTS BY EXOS-B/SIPLE STATION TRANSMISSIONS
I. Kimura, H. Matsumoto, T. Mukai (ISAS, Tokyo), K. Hashimoto, T. F. Bell (Stanford Univ., Calif.), and U. S. Inan (Stanford Univ., Calif.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 529-532 refs Sponsored by Japanese Ministry of Education, Science and Culture, Japan Society for the Promotion of Science, NASA and NSF (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24623# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ENERGETIC ELECTRON ANISOTROPY AND ELF WAVES ONBOARD GEOS. HOW DOES QUASI-LINEAR DIFFUSION WORK
J. Solomon, N. Cornilleau-Wehrlin, A. Korth (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), and G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 533-537 refs Sponsored by CNRS (For primary document see N85-24544 14-46)
(Contracts CNES-214; BMFT-WRK(243)-RV14-B12/73-SF21)
Avail: NTIS HC A99/MF E03

N85-24703# Joint Publications Research Service, Arlington, Va.
HYGIENIC STANDARDIZATION OF ELECTROMAGNETIC

FIELDS OF RADAR SYSTEMS Abstract Only
Yu. D. Dumanskiy, D. S. Ivanov, N. G. Nikitina, and L. A. Tomashevskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 96 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 9, Sep. 1984 p 37-40 (For primary document see N85-24697 14-52)
Avail: NTIS HC A08/MF A01

N85-24760 Centre National d'Etudes Spatiales, Toulouse (France).
SYNTHETIC APERTURE RADAR DATA PROCESSING [TRAITEMENT DES DONNEES DU RADAR A SYNTHESE D'OUVERTURE]
M. D. Vaillant *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 983-1013 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24624# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
ELF CHORUS IN THE EARTH'S OUTER MAGNETOSPHERE
A. E. Antonova *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 539-542 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24625# Ceskoslovenska Akademie Ved, Prague.
DEUTERON WHISTLERS AT LOW LATITUDES IN THE LOW ALTITUDE TOPSIDE IONOSPHERE
J. Boskova, F. Jiricek, and P. Triska *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 543-547 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF A01

N85-24626# China Scientific and Technical Univ., Hofei.
LOW-LATITUDE DUCTED WHISTLERS OBSERVED AT SANYA, HAINAN, CHINA
S. Wang and Y. Wang *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 549-552 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24627# Radio Research Labs., Tokyo (Japan).
WHISTLER OBSERVATION AT OKINAWA, JAPAN DURING THE IMS
T Ondoh, M. Kotaki, Y. Nakamura, and S. Watanabe *In* ESA Achievements of a Intern. Magnetospheric Study (IMS) Sep. 1984 p 553-557 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24628# British Antarctic Survey, Cambridge (England).
WHISTLER MODE WAVES NEAR THE PLASMAPAUSE: RESULTS FROM THE IMS VLF EXPERIMENT AT HALLEY, ANTARCTICA
A. J. Smith, M. Lester (Sheffield Univ., England), J. P. Matthews (Sheffield Univ., England), and K. H. Yearby (Sheffield Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 559-562 refs Sponsored by UK Science and Engineering Research Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24629# British Antarctic Survey, Cambridge (England).
CONJUGACY OF ELF-VHF EMISSIONS NEAR L=6
Natsuo Sato and Hiroshi Fukunishi *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 P 563-567 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24630# Banaras Hindu Univ., Varanasi (India). Inst. of Applied Physics.
GENERATION AND PROPAGATION OF ELECTRON CYCLOTRON HARMONIC WAVES
R. N. Singh, R. Prasad, and V. Singh *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 569-573 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24631# British Antarctic Survey, Cambridge (England).
THEORETICAL STUDIES OF ELECTRIC CYCLOTRON HARMONIC (ECH) WAVES BASED ON EXPERIMENTAL DATA FROM GEOS 1
R. B. Horne and P. J. Christiansen (Sussex Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 575-579 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24632# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ROLE OF EQUATORIAL ELECTRON CYCLOTRON HARMONIC (ECH) WAVES IN THE GENERATION OF DIFFUSE AURORAS. CONTRIBUTION OF THE GEOS IMS SPACECRAFT
P. Canu, G. Belmont, and D. Fontaine *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 581-584 refs (For primary document see N85-24544 14-46)
(Contract CNES-214)
Avail: NTIS HC A99/MF E03

N85-24634# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
PROPAGATION AND AMPLIFICATION OF ION CYCLOTRON WAVES (ICW'S) IN A MULTICOMPONENT PLASMA. THE EARTH MAGNETOSPHERE AS A GIANT MASER FOR ALFVEN WAVES
A. Roux, S. Perraut, C. deVilledary, A. Korth, G. Kremser (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), J. L. Rauch, and D. T. Young (Bern Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 589-591 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24644# Academy of Sciences (USSR), Moscow. Inst. of the Earth Physics.
RESULTS OF ULF-WAVE INVESTIGATIONS IN THE USSR
V. A. Troitskaya *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 639-642 (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24645# Department of Scientific and Industrial Research, Wellington (New Zealand). Lab. of Physics and Engineering.
SATELLITE, AURORAL RADAR AND GROUND MAGNOMETER OBSERVATIONS OF TRANSIENT ULF PULSATIONS
E. M. Poulter, W. Allan, J. G. Keys, K.-H. Glassmeier (Muenster Univ., West Germany), E. Nielsen (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), and H. Junginger (Max-Planck Institut fuer Physik und Astrophysik, Garching, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 643-647 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24658# Centre National de la Recherche Scientifique, Orleans (France).
THE USE OF THE SPECTRAL MATRIX IN ANALYZING THE PROPAGATION CHARACTERISTICS OF ELECTROMAGNETIC EMISSIONS
F. Lefeuvre and M. Parrot *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 715-722 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-24218 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
DESIGN AND PERFORMANCE OF ETCHED POLARISATION TRANSFORMERS FOR MICROWAVE FREQUENCIES
D. A. McNamara and D. E. Baker 1983 9 p refs
(R-NIAS-26; R-1) Copyright. Avail: Issuing Activity

The design and measured performance of two types of transmission polarization transformers are described. The first type is the linear polarizer which can rotate the polarization of the linearly polarized incident wave through an arbitrary angle. The second type converts the linear polarization to right or left circular. Polarization transformation is achieved by passing the wave through an n-layer sandwich consisting of sheets of conducting grids etched on very thin printed circuit board and separated by dielectric spacers. E.A.K.

N85-24219*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical and Computer Engineering.
ADVANCED DETECTORS AND SIGNAL PROCESSING FOR BUBBLE MEMORIES Interim Report, 1 Sep. 1983 - 31 Aug. 1984
M. H. Kryder, P. H. L. Rasky, and D. W. Greve Apr. 1985 75 p refs
(Grant NAG1-395)
(NASA-CR-172534; NAS 1.26:172534) Avail: NTIS HC A04/MF A01 CSCL 09C

The feasibility of combining silicon and magnetic bubble technologies is demonstrated. Results of bubble film annealing indicate that a low temperature silicon on garnet technology is the most likely one to succeed commercially. Annealing ambients are also shown to have a major effect on the magnetic properties of bubble films. Functional MOSFETs were fabricated on bubble films coated with thick (approximately 1 micron) SiO2 layers. The two main problems with these silicon on garnet MOSFETs are low electron mobilities and large gate leakage currents. Results indicate that the laser recrystallized silicon and gate oxide (SiO2) layers are contaminated. The data suggest that part of the contaminating ions originate in the sputtered oxide spacer layer and part originates in the bubble film itself. A diffusion barrier, such as silicon nitride, placed between the bubble film and the silicon layer should eliminate the contamination induced problem. A.R.H.

N85-24220*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE COLD ELECTRONICS WORKSHOP
E. Tward, ed. and R. Kirschman, ed. 15 Nov. 1984 108 p refs Workshop held in Pasadena, Calif., 3-4 Oct. 1984 Prepared for ONR, Washington, D.C.
(Contract NAS7-918)
(NASA-CR-175662; JPL-Pub-84-83; NAS 1.26:175662) Avail: NTIS HC A06/MF A01 CSCL 09C

The benefits and problems of the use of cold semiconductor electronics and the research and development effort required to bring cold electronics into more widespread use were examined. For individual titles, see N85-24221 through N85-24226.

N85-24221*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COLD ELECTRONICS: AN OVERVIEW
R. Kirschman *In its* Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 3-22 refs (For primary document see N85-24220 14-33)
Avail: NTIS HC A06/MF A01 CSCL 09C

Generally speaking, several roles are seen for low temperatures in electronics: As a means of extracting better performance from existing technology, avoiding expense and delay required for the advances in design or fabrication which would be needed to achieve the same performance at room temperature. As a necessity in the quest for improved performance, to counteract detrimental effects which arises as technology is pushed to extremes. As an opportunity to take advantage of effects made available by low temperature operation, and to develop new devices based on them. The electronic devices and circuits considered are those based on semiconductivity. Superconductive devices and circuits are not included. G.L.C.

N85-24222*# Office of Naval Research, Washington, D. C.
RECENT DEVELOPMENTS IN SEMICONDUCTOR RESEARCH
M. N. Yoder *In* JPL Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 40-50 refs (For primary document see N85-24220 14-33)
Avail: NTIS HC A06/MF A01 CSCL 09C

Recent findings drawn from various laboratories focused toward a new understanding of the nature of crystal growth and how impurities are incorporated or excluded from the lattice were considered. From these findings a heuristic approach is given for improving the uniformity and charge carrier concentration of thin semiconductor films. Such improvement is considered essential to achieve respectable yield on large scale integrated circuits. A tentative conclusion is drawn which indicates that if the host compound crystal reactants are provided to the growing crystal surface in a reasonably stoichiometric manner, it is virtually impossible to include impurities into a growing crystal surface held at a sufficiently low temperature; impurities are incorporated into the crystal by gettering action of crystal defects located one and two monlayers beneath the growing surface. Devices in 3-5 semiconductors based on heterojunctions and two dimensional electron gases are noted and reliability concerns are voiced. Alternatives and novel device structures such as truly single crystal high quality silicon on insulator and beta silicon carbide devices are presented. Author

N85-24223*# Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
PHYSICAL ELECTRONICS OF COOLED OPERATION OF VERY SHORT COMPOUND SEMICONDUCTOR TRASNSISTORS
Lester F. Eastman *In* JPL Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 51-69 refs (For primary document see N85-24220 14-33)
Avail: NTIS HC A06/MF A01 CSCL 09C

Very high performance is being developed in compound semiconductor transistors. High frequency and low noise figure operation in the GaAs FET have already been established. Substantially more performance increases are expected. A comparison of compound semiconductor materials, and their alloys, the physical concepts of high average electron velocity, and the special benefits of modulation doped heterojunction FET devices is presented. G.L.C.

N85-24224*# Arizona State Univ., Tempe. Center for Solid State Electronics Research.
THE EFFECTS OF COOLING ON DELAY-TIME LIMITS IN IC'S
R. O. Grondin and D. K. Ferry *In* JPL Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 70-82 refs (For primary document see N85-24220 14-33)
Avail: NTIS HC A06/MF A01 CSCL 09C

The effect of cooling as a fundamental limit to delay times in IC's was considered. It appears that the delay time should be decreased at cryogenic temperatures. G.L.C.

N85-24225*# Bell Telephone Labs., Inc., Murray Hill, N. J.
SI MOS DEVICES AT LOW TEMPERATURES
Avid Kamgar *In* JPL Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 83-91 refs (For primary document see N85-24220 14-33)

Avail: NTIS HC A06/MF A01 CSCL 09C

Low temperature operation of micron and submicron size Si MOSFETs (metal-oxide-semiconductor field-effect-transistors) results in their improved device characteristics. Various low temperature device properties such as increase in mobility, shift in the theshold voltage, increased reliability, etc., were considered. Other device characteristics such as the subthreshold behavior, delay times and miniaturization at low temperatures are discussed. Discussion includes presenting experimental results along with physical models explaining the observed effects. G.L.C.

N85-24226*# National Radio Astronomy Observatory, Charlottesville, Va.

CRYOGENICALLY-COOLED, LOW-NOISE MICROWAVE RECEIVERS: PRESENT STATUS AND FUTURE NEEDS

Sander Weinreb *In* JPL Proc. of the Cold Electronics Workshop 15 Nov. 1984 p 92-102 refs (For primary document see N85-24220 14-33)

Avail: NTIS HC A06/MF A01 CSCL 09C

An overview (in outline form) of cryogenically cooled, low noise microwave receivers is presented. Included are the following: (1) a state of the art summary; (2) cooled GaAs FET devices; (3) examples of cooled microwave amplifiers; (4) cooling technology; and (5) recommendations for research and development. G.L.C.

N85-24227*# Gould, Inc., Rolling Meadows, Ill. Electronic and Computer Systems Lab.

AN IMPROVED BATTERY STATE-OF-CHARGE INDICATOR Final Supplemental Report

Robert T. Calvert 30 Sep. 1984 150 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955782)

(NASA-CR-175701; DOE/CS-54209/25; JPL-9950-970; NAS 1.26:175701) Avail: NTIS HC A07/MF A01 CSCL 09A

An adaptive battery parameter algorithm which would compensate for aging batteries and varying environmental conditions was developed and implemented in the FORTRAN software. The state of charge indicator consists of a microcomputer system which is used to acquire battery data, exercise the software program, and provide system control for the battery charger. The control system has four operational modes: (1) discharge monitoring; (2) charging; (3) wake-up; and (4) think (parameter adaptation). A.R.H.

N85-24228*# Ford Aerospace and Communications Corp., Palo Alto, Calif. Western Development Lab.

DESIGN, FABRICATION AND TESTING OF A MULTIBEAM FORMING NETWORK Final Report

Sep. 1984 37 p

(Contract NAS7-100)

(NASA-CR-175695; NAS 1.26:175695) Avail: NTIS HC A03/MF A01 CSCL 09C

A concept for a multiple beam forming network to route signals from eight input ports to twenty-one output ports so as to form eight independent seven-element cluster radiators was designed, fabricated, and tested. The operating frequency band is 2.226 to 2.254 GHz and the maximum power to any input port is two watts. The network consists of eight seven-way power dividers connected to twenty-one seven-way power combiners. The network utilizes barline circuits between parallel ground planes for the power distribution and collection. Interconnections are made with short rigid co-axial lines built into the network. The concept, general design procedures, mechanical configuration, and electrical performance are described. It appears that the network is quite satisfactory for demonstrating practical feasibility of the technical concept. Author

N85-24229# Naval Civil Engineering Lab., Port Hueneme, Calif.

USER'S GUIDE TO CALIBRATION OF ANALOG ELECTRONIC CONTROLLERS IN HVAC SYSTEMS

R. Kirts Nov. 1984 30 p

(AD-A150803; NCEL-UG-0001) Avail: NTIS HC A03/MF A01 CSCL 09/1

The calibration of analog electronic proportional controllers requires the knowledge of at least three characteristics of the controller: the action, the setpoint, and the throttling range. The calibration procedure follows these steps: measure the controller input(s); calculate the predicted controller output; measure the actual controller output, and adjust the controller as required. Using this procedure, controller performance is evaluated at the control point, or actual condition, rather than the setpoint, which is the idealized, desirable condition. This means that only those controllers which are actually out of calibration need to be adjusted and controllers that are in calibration need not have any settings or adjustments changed. If a controller cannot be calibrated or will not remain calibrated for a responsible period of time, it is defective and should be repaired or replaced. GRA

N85-24230# Polytechnic Inst. of New York, Brooklyn. Microwave Research Inst.

BASIC RESEARCH IN ELECTRONICS (JSEP) Annual Report, 1 Apr. - 31 Dec. 1984

A. A. Oliner 31 Dec. 1984 231 p

(Contract F49620-82-C-0084)

(AD-A151002; POLY-MRI-1432-83; AFOSR-85-0122TR) Avail: NTIS HC A11/MF A01 CSCL 09/3

This report presents a summary of the scientific progress and accomplishments on research projects funded by the Joint Services Electronics Program (JSEP) for the contract period from 1 April 1984 through 31 December 1984. It does not contain information regarding accomplishments on research projects funded in other ways. The Joint Services Electronics Program at the Polytechnic is the core of interdisciplinary research in electronics encompassing programs in the Departments of Electrical Engineering and Physics under the aegis of the Microwave Research Institute. The research encompassed by this program is grouped under three broad categories: Electromagnetics, Solid State Electronics and Information Electronics. The detailed projects (research units) comprising the complete program are listed in the Table of Contents. GRA

N85-24231# Mission Research Corp., Alexandria, Va.

DESIGN AND TESTING OF GYROKLYSTRON AMPLIFIERS Final Report, 24 Jun. 1983 - 24 Jul. 1984

W. M. Bollen, M. Nagurney, D. Pershing, and C. Sedlak Aug. 1984 82 p

(Contract N00014-83-C-2192)

(AD-A151026; MRC/WDC-R-088) Avail: NTIS HC A05/MF A01 CSCL 09/5

The purpose of this program is to assess GKA characteristics in order to determine if a microwave tube is capable of achieving the high efficiency, gain, and output power predicted by numerous theories. The first in a series of tubes to examine GKA behavior has been fabricated and is currently under test. Section 1 of this report gives a background on past theory and experiment, as well as a basic description of gyroklystron physics. Section 2 describes, on a task-by-task basis, the work performed in Phase 1 of this contract. GRA

N85-24232# Department of the Air Force, Washington, D.C.

AUTONOMOUS UNINTERRUPTABLE POWER SUPPLY APPARATUS Patent Application

J. H. Masson, inventor (to Air Force) Filed 20 Dec. 1984 18 p

(AD-D011571; US-Patent-Appl-SN-684240) Avail: NTIS HC A02/MF A01 CSCL 10/2

This invention relates broadly to a power supply apparatus, and in particular to an autonomous uninterruptable power supply apparatus. The purpose of an uninterruptable power supply (UPS) is to protect critical electrical loads from transient or steady stage outages or disturbances in the primary power source. The basic configuration of a typical, commercially available, uninterruptable power supply is comprised at a minimum of a standby battery and a battery charger and may also include an inverter for AC applications. Systems of this type can be found in most computer installations and laboratory systems which cannot tolerate even momentary disturbances of input power. This document describes

an autonomous uninterruptable power supply apparatus utilizing a digital processor unit as a control and monitor unit to measure and control input and output parameters in the power supply. A battery charger is utilized to maintain the voltage and current levels with the backup battery supply source which powers an inverter unit that converts the DC power to an AC output. GRA

N85-24233# Department of the Army, Washington, D. C.
DIELECTRIC RESONATOR Patent Application
A. Ballato, inventor (to Army) Filed 11 Feb. 1985 24 p
(AD-D011573; US-Patent-Appl-SN-699990) Avail: NTIS HC A02/MF A01 CSCL 09/1

This invention relates generally to signal oscillators and more particulary to microwave and millimeter wave oscillators comprised of dielectric resonators. A method and means for producing a zero temperature coefficient for providing frequency stabilization as well as adjusting the frequency at a particular temperature of a dielectric resonator element mounted on a substrate and having a dielectric disc affixed to the top of the resonator element is discussed. A zero temperature coefficient is obtained by selectively choosing the thickness of the dielectric disc depending upon the temperature coefficients of the constituent material of both the disc and resonator element. The operating frequency at a given temperature is furthermore adjusted by including two mutually contiguous patterns of metallization on the top surface of the resonator element and the bottom surface of the dielectric disc and thereafter rotating the disc so that a predetermined percentage of overlap between the two patterns exists. GRA

N85-24234# Westinghouse Electric Corp., Pittsburgh, Pa.
INVESTIGATION OF DOUBLY-FED MACHINE IN VARIABLE SPEED APPLICATION
1984 29 p Presented at the Conf. on Doubly-Fed Machine Rev., Washington, 15 Nov. 1984
(Contract DE-AC02-81RA-50292)
(DE85-004378; DOE/RA-50292/T2) Avail: NTIS HC A03/MF A01

A computer controlled speed regulator for the MOD-O wind turbine was implemented. Modifications to the software were necessary, however, the variable speed system is now operational. G.L.C.

N85-24235# Laboratorium Elektronische Ontwikkelingen voor de Krijgsmacht TNO, Oegstgeest (Netherlands).
MAXIMUM ENTROPY SPECTRAL ANALYSIS
Cames C. P. L. vanBatenburg 30 Aug. 1984 52 p refs In DUTCH; ENGLISH summary
(Contract A03/73/K)
(LEOK-TR-1984-08; TDCK-79527) Avail: NTIS HC A04/MF A01

The maximum entropy method (MEM) was used to determine the power density spectrum of a signal. The theory of the MEM and the autoregressive model are explained. The hardware implementation of the MEM is described. The results of computer simulations are presented. The signals used in the simulations are formed by the superposition of up to three sinusoids. From the signals, the MEM-spectrum and the discrete Fourier transformation (DFT) spectrum are determined. The MEM-spectrum has a higher resolution and accuracy than the DFT-spectrum. The optimal choice of the order of the autoregressive model depends strongly on the type of signal, making the MEM more suited for special applications. Author (ESA)

N85-23885# Eidsvoll Electronics A.S. (Norway).
EQUIPMENT FOR THE ARGOS SYSTEM FROM EIDSVOLL ELECTRONICS A.S.
Ivar Nordby *In* CNES Data Collection and Platform Location by Satellite 1981 3 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-24236 Lehigh Univ., Bethlehem, Pa.
INTERACTIONS OF UNSTABLE SHEAR LAYERS WITH LEADING EDGES AND ASSOCIATED PRESSURE FIELDS Ph.D. Thesis
Celalettin Ruhi Kaykayoglu 1984 198 p
Avail: Univ. Microfilms Order No. DA8429413

The relationship between an unsteady shear layer interacting with a leading edge and the consequent unsteady pressure field along the surface of the edge is investigated. Three basic types of incident vorticity fields are considered: a distributed vorticity field at a single frequency; a concentrated vortex at a single frequency; and multiple concentrations of vorticity having a number of discrete frequencies. In generating these types of approach flow conditions, configurations of a planar jet and mixing layer are employed. By using simultaneous hot film/laser-Doppler anemometry, a surface pressure measurement technique and flow visualization using hydrogen bubbles and dye injection, it is possible to relate details of the flow distortion in the leading edge region to the unsteady surface pressure field. Common to all types of interactions at the leading edge is generation of regions of secondary vorticity. Dissert. Abstr.

N85-24237*# National Aeronautics and Space Administration, Washington, D. C.
GENERATION AND DEVELOPMENT OF SMALL-AMPLITUDE DISTURBANCES IN A LAMINAR BOUNDARY LAYER IN THE PRESENCE OF AN ACOUSTIC FIELD
Yu. S. Kachanov, V. V. Kozlov, and V. Ya. Levchenko Apr. 1985 19 p refs Transl. into ENGLISH from Izv. (USSR), Ser. Tekhn. Nauk, Oct. 1975 p 18-26 Original language document was announced in IAA as A76-17655 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77826; NAS 1.15:77826) Avail: NTIS HC A02/MF A01 CSCL 20D

A low-turbulence subsonic wind tunnel was used to study the influence of acoustic disturbances on the development of small sinusoidal oscillations (Tollmien-Schlichting waves) which constitute the initial phase of turbulent transition. It is found that acoustic waves propagating opposite to the flow generate vibrations of the model (plate) in the flow. Neither the plate vibrations nor the acoustic field itself have any appreciable influence on the stability of the laminar boundary layer. The influence of an acoustic field on laminar boundary layer disturbances is limited to the generation of Tollmien-Schlichting waves at the leading-edge of the plate. V.P. (IAA)

N85-24238*# National Aeronautics and Space Administration, Washington, D. C.
STABILITY OF AN OSCILLATING BOUNDARY LAYER
V. Ya. Levchenko and A. S. Solovyev Mar. 1985 16 p refs Transl. into ENGLISH from Izv. (USSR), Ser. Tekhn. Nauk, Oct. 1975 p 10-17 Original language document was announced as A76-17654 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77827; NAS 1.15:77827) Avail: NTIS HC A02/MF A01 CSCL 20D

Levchenko and Solov'ev (1972, 1974) have developed a stability theory for space periodic flows, assuming that the Floquet theory is applicable to partial differential equations. In the present paper, this approach is extended to unsteady periodic flows. A complete unsteady formulation of the stability problem is obtained, and the stability characteristics over an oscillating period are

determined from the solution of the problem. Calculations carried out for an oscillating incompressible boundary layer on a plate showed that the boundary layer flow may be regarded as a locally parallel flow. V. P. (IAA)

N85-24239*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DISCRETE MODELS FOR THE NUMERICAL ANALYSIS OF TIME-DEPENDENT MULTIDIMENSIONAL GAS DYNAMICS Final Report
Philip L. Roe Mar. 1984 38 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-172574; NAS 1.26:172574; ICASE-85-18) Avail: NTIS HC A03/MF A01 CSCL 20D

A possible technique is explored for extending to multidimensional flows some of the upwind-differencing methods that are highly successful in the one-dimensional case. Emphasis is on the two-dimensional case, and the flow domain is assumed to be divided into polygonal computational elements. Inside each element, the flow is represented by a local superposition of elementary solutions consisting of plane waves not necessarily aligned with the element boundaries. Author

N85-24240*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS FOR MODELING SUPERSONIC CHEMICALLY REACTING FLOW FIELDS Final Report
J. Philip Drummond, M. Yousuff Hussaini, and Thomas A. Zang Mar. 1985 41 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-172578; ICASE-85-20; NAS 1.26:172578) Avail: NTIS HC A03/MF A01 CSCL 20D

A numerical algorithm was developed for solving the equations describing chemically reacting supersonic flows. The algorithm employs a two-stage Runge-Kutta method for integrating the equations in time and a Chebyshev spectral method for integrating the equations in space. The accuracy and efficiency of the technique were assessed by comparison with an existing implicit finite-difference procedure for modeling chemically reacting flows. The comparison showed that the procedure presented yields equivalent accuracy on much coarser grids as compared to the finite-difference procedure with resultant significant gains in computational efficiency. Author

N85-24241# Council for Scientific and Industrial Research, Pretoria (South Africa). Heat Mechanics Div.
A REVIEW OF DEVELOPMENT AND APPLICATION OF HEAT PUMP TECHNOLOGY
A. Johannsen Jan. 1984 63 p refs
(CSIR-RR-585; ISBN-0-7988-2384-4) Avail: NTIS HC A04/MF A01

A review is presented of the current state-of-the-art of heat pump technology. Included is a discussion of basic heat pump cycles, their practical implementation and the extent of the utilization of the different heat pump systems in different countries. Trends in the current research and development of advanced heat pump systems are also discussed. B.W.

N85-24242# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
AN ANALYTICAL AND NUMERICAL STUDY OF THE INTERACTION OF RAREFACTION WAVES WITH AREA CHANGES IN DUCTS. PART 2: AREA ENLARGEMENTS
O. Igra, J. J. Gottlieb, and T. Saito Dec. 1984 68 p refs
(UTIAS-273; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

A quasi-steady flow analysis that is analytical for an inviscid flow of a perfect gas is presented to obtain asymptotic solutions for the flow at late times, after all transient disturbances from the interaction process have subsided. Analytical results are given and discussed for the boundary between the two possible asymptotic wave patterns that are predicted and the corresponding asymptotic strengths of the transmitted, reflected and other waves, all as a function of both the incident rarefaction-wave strength and area-enlargement ratio. This was done for both perfect diatomic gases and air with gamma = 7/5 and perfect monatomic gases with gamma = 5/3. Numerical results obtained by employing the random-choice method to solve the nonstationary equations of motion are presented and discussed for the complete unsteady rarefaction-wave interaction with the area enlargement, for numerous different combinations of rarefaction-wave strengths and area-enlargement ratios. Author

N85-24243*# National Aeronautics and Space Administration, Washington, D. C.
THE VOLUME CHANGE DURING SOLIDIFICATION
M. Rittich Mar. 1985 19 p refs Transl. into ENGLISH of Conf. from Deut. Ges. fuer Luftund Raumfahrt, Bonn p 135-143 Presented at the Spacelab Utilization: Mater. Res. and Technol. in Space; Seminar on Current Status, Bonn, 4-6 Oct. 1982 Original language doc. was announced in IAA as A84-36194 Transl. by Scientific Translation Services, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77817; NAS 1.15:77817) Avail: NTIS HC A02/MF A01 CSCL 20D

The liquid-solid phase transformation of solidifying metallic melts is accompanied by a volume change Delta-Vm. This volume change produces a gravity-independent microscopic flow near the solidification front. In a ground-based laboratory, solidification processes are also affected by convection due to temperature and concentration gradients. A quantitative evaluation of the effects of these flows on the formation of structure requires reproducible values of Delta-Vm. Alloys with Delta-Vm = 0 would be best suited for such an evaluation, while alloys with a constant value for Delta-Vm are still usable. Another requirement is related to a solidus-liquidus interval which is as small as possible. One-phase alloys, which would be particularly well suited, could not be found. For these reasons, alloys which solidify in two phases, as for example eutectics, have been considered, taking into account the Al-Ge system. Attention is given to the volume change at the melting point, the measurement of this change, the volume change at solidification, and applications to terrestrial technology. G.R. (IAA)

N85-24244*# National Aeronautics and Space Administration, Washington, D. C.
CONTRIBUTION TO THE THEORY OF STATIONARY SEPARATION AREAS
G. I. Taganov Apr. 1985 39 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zidk. i Gaza (USSR), Sep. - Oct. 1968 p 3-19 Original language doc. was announced in IAA as A69-12570 Transl. by The Corporate Word, Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77825; NAS 1.15:77825) Avail: NTIS HC A03/MF A01 CSCL 20D

An attempt is made to determine the region of existence of possible steady flows with a closed separation area in a range of Reynolds numbers such that flow in the viscous mixing area can be described by the Prandtl's equations. The boundary conditions for the flow in the separation region are selected so as to simplify the flow pattern in this region, making it possible to use the methods of hydrodynamic analysis. A rule for determining stable steady flows with separation areas is formulated which is well suited for analyzing laminar flows and can be applied to turbulent flows in some areas. Author

N85-24245*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED RADIATOR CONCEPTS
Priscilla S. Diem-Kirsop 30 Jun. 1985 13 p refs Proposed for presentation at Soc. of Women Engr. Natl. Convention, Minneapolis, 27-30 Jun. 1985
(NASA-TM-87008; E-2552; NAS 1.15:87008) Avail: NTIS HC A02/MF A01 CSCL 20D

The liquid droplet radiator and the liquid belt radiator currently under study by the NASA LeRC are discussed. These advanced concepts offer benefits in reduced mass, compact stowage, and

ease of deployment. Operation and components of the radiators are described, heat transfer characteristics are discussed, and critical technologies are identified. The impact of the radiators on large power systems is also assessed. A.R.H.

N85-24246# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
ADVANCED DIAGNOSTICS FOR REACTING FLOWS Annual Scientific Report, 1 Oct. 1983 - 30 Sep. 1984
R. K. Hanson 21 Dec. 1984 69 p Original contains color illustrations
(Contract F49620-83-K-0004)
(AD-A150675; AFOSR-85-0086TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Progress is reported for the fourth year of an interdisciplinary program to innovate modern diagnostic techniques applicable to reacting and plasma flows. Research topics include: (1) fiber optic absorption/fluorescence sensors employing tunable ultraviolet, visible and infrared laser sources for species measurements; (2) wavelength-modulation spectroscopy, using rapid-scanning ultraviolet, visible and infrared laser sources, for absorption and fluorescence measurements of species, temperature and absorption lineshapes; (3) quantitative flow visualization, including temporally and spatially resolved species and temperature measurements in a plane, using laser-induced fluorescence; (4) quantitative particle visualization in spray flames using Mie scattering; (5) multiple-point velocity visualization; (6) advanced solid-state camera/computer systems for high speed and high-resolution recording, processing and display of flow visualization data; (7) plasma diagnostics, utilizing planar laser-induced fluorescence and wavelength modulation techniques; (8) optical processing and phase conjugation studies; and (9) investigation of other new diagnostic concepts. GRA

N85-24247# GA Technologies, Inc., San Diego, Calif.
FLUID MECHANICS AND HEAT TRANSFER SPIRALLY FLUTED TUBING Final Report
J. S. Yampolsky, P. A. Libby, B. E. Launder, and J. C. LaRue Dec. 1984 370 p Original contains color illustrations
(Contract N00014-82-C-0721)
(AD-A150774; GA-A17833) Avail: NTIS HC A16/MF A01 CSCL 20/4

The objective of this program is to develop an understanding of the fluid mechanics and heat transfer mechanisms that result in the demonstrated performance of the spiral fluted tubing under development at GA Technologies Inc. Particularly emphasized are the processes that result in the augmentation of the heat transfer coefficient without an increase in friction coefficient in the single-phase flow. Quantitative delineation of these processes would allow for their application to the optimal solution of heat transfer problems in general was well as to tubular heat exchanges using spiral fluted tubes. The experimental phase of the program consisted of the following: (1) Flow visualization studies using high-speed photography of dye injected into water flowing in a cast acrylic spiral fluted tube. (2) Time-resolved axial velocity measurements as a function of radius at the exit plane of a spiral fluted tube with water flowing through the tube. (3) Simultaneous time-resolved measurements of the axial and radial velocity components and temperature with heated air flowing through the tube cooled by a water jacket. GRA

N85-24248# Naval Postgraduate School, Monterey, Calif.
HEAT TRANSFER TO VERTICAL FLAT PLATES IN A RECTANGULAR GAS-FLUIDIZED BED M.S. Thesis
D. C. Neily Jun. 1984 207 p
(AD-A150785) Avail: NTIS HC A10/MF A01 CSCL 13/7

This experimental study was conducted at the Naval Postgraduate School to investigate the heat transfer characteristics of flat vertical plates in a rectangular gas-fluidized bed. The primary objective was to determine what effect variations in the bed width-to-height ratio had on heat transfer to the vertical flat plates forming the container walls. The experiment was conducted using a specially heated and instrumented fluidized bed equipped with a movable side wall which permitted modification of the bed geometry. As the width of the bed was adjusted, the settled bed height was maintained at a constant level by the addition or removal of bed material. A secondary objective of the study was to determine the effect of variations in the fluidization gas flow rate on heat transfer to the bed walls. Pressure drop measurements as well as visual observations were used to determine minimum fluidization flow rates for each configuration. Heat transfer coefficients were calculated for each flow rate and bed geometry using temperature data obtained from a computer controlled thermocouple network. GRA

N85-24249# Spectron Development Labs., Inc., Costa Mesa, Calif.
A FUNDAMENTAL STUDY OF LIQUID PHASE PARTICLE BREAKUP. REVISION Final Report
Dec. 1984 57 p
(Contract F49620-81-C-0032)
(AD-A150791; SDL-84-2193-11F-Rev; AFOSR-85-0080TR-Rev)
Avail: NTIS HC A04/MF A01 CSCL 20/4

Combustion efficiency of aluminized propellants in solid rocket motors is reduced by incomplete aluminum combustion and two-phase nozzle flow losses. Combustion of these propellants can produce large Al/Al2O3 agglomerates. As a direct result of agglomerate breakup, the aluminum combustion rate is increased, and the thermal energy released is more efficiently transferred into exhaust kinetic energy. This research sought to obtain physical data to characterize the mechanisms of aerodynamic droplet breakup. Experiments have been completed in which conventional liquids and a liquid metal (mercury) was studied. The primary goal of the conventional liquid experiments was to examine the effect of liquid properties (viscosity and surface tension) on the breakup mechanism, time scale, and fragment size distribution. The goal of the mercury experiments was to examine the effect of the much higher surface tension more characteristic of liquid aluminum. A key element of the experimental effort is the use of nonintrusive laser diagnostics including pulsed laser holography (PLH) and laser Doppler velocimetry (LDV). The exceptional temporal and spatial resolution of PLH provided the ability to resolve the mechanism of breakup and the size distribution of the fragments. LDV was used to determine drop velocity distributions along the nozzle revealing the rapid acceleration of the flattened droplets and then, surprisingly, the milder acceleration of the fragments. GRA

N85-24250# Argonne National Lab., Ill.
BLOCK-IMPLICIT MULTIGRID SOLUTION OF NAVIER-STOKES EQUATIONS IN PRIMITIVE VARIABLES
S. P. Vanka and G. K. Leaf 1985 4 p refs
(Contract W-31-109-eng-38)
(DE85-004071; DOE/NBM-5004071) Avail: NTIS HC A02/MF A01

The development of an efficient general purpose calculation procedure for turbulent chemically reacting internal flows is discussed. The approach is to solve the time averaged Navier-Stokes equations governing the conservation of mass, momentum, and chemical species and two turbulence quantities such as the kinetic energy of turbulence and its rate of dissipation. The equations in such a set are highly nonlinear and strongly coupled. Of particular mention is the coupling between the pressure and velocity fields implicitly through the momentum and continuity equations. DOE

N85-24251# Institut Franco-Allemand de Recherches, St. Louis (France).
THE SIGNIFICANCE FOR LASER ANEMOMETRY OF PARTICLES CARRIED ALONG IN A GAS FLOW [UEBER DIE BEDEUTUNG DER IN EINER GASFOERMIGEN STROEMUNG MITGEFUEHRTEN TEILCHEN IN DER LASERANEMOMETRIE]
J. Haertig 4 Mar. 1983 26 p refs In GERMAN Presented at LDA 2 Conf., Paris, 23-24 1983; sponsored by DISA Electronique
(ISL-CO-205/83) Avail: NTIS HC A03/MF A01

Problems in laser anemometry due to solid particles floating in a gas flow are discussed. It is explained under which conditions

the velocity of the particles is equal to the flow velocity, and how these particles can be observed with a photodetector using light scattering by microparticles. The problems related to the introduction of particles in the flow are discussed. Author (ESA)

N85-24252# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL SIMULATION OF THE FLOW INSIDE A GUN BARREL
F. Seiler 31 Mar. 1983 23 p refs In GERMAN Presented at 7th Intern. Symp. on Ballistics, The Hague, 19-21 Apr. 1983
(ISL-CO-208/83) Avail: NTIS HC A02/MF A01

The flow in a gun barrel was simulated in a high pressure shock tube. The effect of the projectile base shape on the flow was examined. Several converging transitions were put in the gun barrel, which was equipped with observation windows. A differential interferometer visualized the flow. In the case of a projectile tail a vortex is observed in the corner between projectile and gun barrel. Vortices are also observed in the transition zone. In the transition area between the gun barrel and the projectile a stationary boundary layer is formed which goes over into an unstationary boundary layer behind the projectile. Author (ESA)

N85-24253# Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF LASER ANEMOMETRY TO JETS IN COMBUSTION CHAMBERS [ANWENDUNG DER LASERANEMOMETRIE AUF BRENNKAMMERSTRAHLEN]
H. J. Schaefer 25 Apr. 1983 29 p refs In GERMAN Presented at Seminar on Anemometrie Laser en Combust., Saint Denis, France, 20 Apr. 1983; sponsored by Combustion Inst.
(ISL-CO-210/83) Avail: NTIS HC A03/MF A01

An experimental investigation was conducted on a hot free jet to assess measuring problems in the application of laser-double-beam-anemometry to hot, high velocity flows. The free jet with a diameter of 80 mm and an exhaust velocity of 400 m/sec was produced in a model combustion chamber which simulates the conditions in a jet engine. The effects of environmental conditions and fluctuating temperature gradients; the injection of scattering particles; and the signal processing are discussed. Experimental results showing the presence of large coherent structures on the axis of the hot free jet demonstrate the efficiency of the anemometers. Author (ESA)

N85-24254# Institut Franco-Allemand de Recherches, St. Louis (France).
LASER ANEMOMETRY TWO DIMENSIONAL MEASUREMENT OF VELOCITY FLUCTUATIONS IN AN EXCITED JET [MESURES BIDIMENSIONNELLES PAR ANEMOMETRIE LASER DES FLUCTUATIONS DE VITESSE DANS UN JET EXCITE]
P. Meyer and P. G. Sava 11 May 1983 23 p refs In FRENCH Presented at Intern. Symp. on Applied LDA to Fluid Mech., Lisbon, 5-7 Jul. 1982 Sponsored by Direction des Recherches Etudes et Techniques
(ISL-CO-213/83) Avail: NTIS HC A02/MF A01

The coherent structure of the velocity fluctuation field in a free jet excited at appropriate frequencies was studied using a 2 component laser anemometer at a 0.5 Strouhal number and at 600,000 Reynolds number. The coherent field is described as a series of turbulent structures conveyed with a phase velocity of 0.56 the initial jet velocity. It is shown that the characteristics of the turbulent field are strongly dependent on space-time location in the coherent field. Author (ESA)

N85-24255# Institut Franco-Allemand de Recherches, St. Louis (France).
EFFECT OF FORM AND CLEARANCE OF A PISTON LAUNCHED IN A TUBE ON THE BOUNDARY LAYER AND THE HEAT TRANSFER [EINFLUSS DER FORM UND DES SPIELS EINES FLUGKOLBENS AUF DIE GRENZSCHICHT UND DEN WAERMEUEBERGANG]
F. Seiler 1 Jun. 1983 34 p refs In GERMAN Presented at Comm. du Conseil Consultatif Rech. et Etudes Meeting on Balistiques Interieures, St. Louis, France, 24 Mar. 1983
(Contract BMVg-T/R-760/DO012/D1712)
(ISL-CO-216/83) Avail: NTIS HC A03/MF A01

Interior ballistic flows in front of and behind a piston launched in a tube were simulated in a shock tube. The boundary layers behind the piston are clearly visualized by differential interferograms. The ground form dependence of the heat flow in the measurement tube wall is smaller than the signal fluctuations. In the case of gas slippage the heat flow measurements show strong effects in front of the piston and in the gap between piston and wall. The flow pictures show no considerable effect of gas slippage on the boundary layer behind the piston, while strong flow effects are observed in front of the piston. Author (ESA)

N85-24256# Institut Franco-Allemand de Recherches, St. Louis (France).
VISUALIZATION OF VELOCITY FIELDS WITH DOPPLER IMAGES [VISUALISIERUNG VON GESCHWINDIGKEITSFELDERN MIT DOPPLERBILDERN]
F. Seiler and H. Oertel 19 May 1983 13 p refs In GERMAN Presented at 3rd Intern. Symp. on Flow Visualization, Ann Arbor, Mich., 6-9 Sep. 1983
(ISL-CO-218/83) Avail: NTIS HC A02/MF A01

Fast changing velocities were investigated by means of Doppler images taken with continuous CO_2 lasers. The fringe shifts of the Doppler pictures provide information about the instantaneous and local tracer velocities in a light cross section, produced with a laser beam. The Doppler shifts of the scattered light frequencies are converted into interference fringe shifts in a Michelson interferometer. In correct alignment the fringes are localized in the picture of the illuminated flow plane. The position of the lines of complete cancellation is then independent of scattered light intensity changes. This visualization method is tested with Doppler pictures of supersonic jets. Author (ESA)

N85-24257# Institut Franco-Allemand de Recherches, St. Louis (France).
THIRTY-THREE YEARS OF RESEARCH WITH SHOCK TUBES IN THE FRANCO-GERMAN RESEARCH INSTITUTE, SAINT LOUIS (FRANCE) [33 JAHRE FORSCHUNG MIT STROSSROHREN IM DEUTSCH-FRANZOESISCHEN FORSCHUNGINSTITUT SAINT LOUIS]
H. Oertel 26 Jul. 1983 20 p refs In GERMAN Presented at 14th Intern. Symp. on Shock Tubes and Waves, Sydney, Aug. 1983
(ISL-CO-226/83) Avail: NTIS HC A02/MF A01

Research in gas dynamics using shock tubes is reviewed. Reflection and diffraction of shock waves on a great variety of objects, their passage though slots, nozzles and several channels, the formation of vortices during these phenomena, and the evaporation of droplets in the flow behind the shock were filmed. Two large high pressure shock tubes were used as subsonic, transonic, supersonic, and hypersonic wind tunnels for the production of nozzle blast waves and supersonic jets, as well as for the investigation of unsteady, head waves and boundary layers. Hot flows behind accelerated pistons, pressure waves in transonic flows, and entrainment of dust in shock waves and vortices were studied. Author (ESA)

N85-24258# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL SIMULATION OF THE FLOWS IN FRONT OF AND BEHIND A PROJECTILE WITH AND WITHOUT GAS SLIPPAGE [EXPERIMENTELLE SIMULATION DER STROEMUNGEN VOR UND HINTER EINEM GESCHOSS MIT UND OHNE GASSCHLUPF]
F. Seiler 7 Oct. 1983 38 p refs In GERMAN; ENGLISH summary Presented at Symp. on Augmentation des Performances de Balistique Interieure des Armes a Tube, Mannheim, West Germany, 11-13 Oct. 1983
(Contract BMVg-T/R-760/D-0012/D-1712)
(ISL-CO-232/83) Avail: NTIS HC A03/MF A01

The interior ballistic flows in front of and behind a projectile

were simulated in a high pressure shock tube. The projectile was accelerated by shock reflection in a rectangular barrel equipped with windows. The flow pattern was visualized with a differential interferometer. The heat flux into the barrel wall was measured with thin film platinum gages. In the flow pictures no influence of gas leakage on the flow pattern behind the projectile was observed. However, the flow in front of the projectile was strongly affected. The heat flux measurements show that in the presence of a gas leakage a heat flux into the wall of the barrel occurs in front of the projectile. The heat flux attains a maximum level in the slit between wall and projectile; this leads to high temperature gradients producing high thermal stresses in the barrel wall. Author (ESA)

N85-24259# Institut Franco-Allemand de Recherches, St. Louis (France).

THE UTILIZATION OF A LIGHT-GAS GUN TO SIMULATE INTERIOR BALLISTIC FLOW [DIE VERWENDUNG EINER LEICHTGASKANONE ZUR SIMULATION INNENBALLISTISCHER STROEMUNGEN]

H. Mach, U. Werner, and H. Masur 19 Oct. 1983 20 p refs In GERMAN; ENGLISH summary Presented at Symp. on Augmentation des Performances de Balistique Interieure des Armes a Tube, Mannheim, West Germany, 11-13 Oct. 1983

(Contract BMVg-T/R-760/D-0013/D-1713)

(ISL-CO-233/83) Avail: NTIS HC A02/MF A01

A light-gas gun was used to simulate the interior ballistics cycle. The flow of the 20 mm caliber light-gas gun is such that at a maximum pressure of 4000 bar, a projectile mass of 100 g can be accelerated to a final velocity of 750 to 1000 m/sec. The ballistic cycle is simulated with light transparent gases. The conditions necessary to realize all the parameters, in particular to generate pressure curves free of shock waves, are determined. Author (ESA)

N85-24260# Institut Franco-Allemand de Recherches, St. Louis (France).

COMPRESSION WAVES IN FRONT OF AND BEHIND A PISTON LAUNCHED IN A SHOCK TUBE [DRUCKWELLEN VOR UND HINTER EINEM FLUCKOLBEN IM STROSSROHR]

H. Oertel 25 Jan. 1983 152 p refs In GERMAN

(Contract BMVg-T/R-760/C-0012/C-1712)

(ISL-R-101/83) Avail: NTIS HC A08/MF A01

Approximate formulas to simulate interior ballistic flow in a shock tube are proposed. Simulation by shock tubes with reflection of the shock on a free piston offers interesting advantages. In order to define the experimental conditions it is required to calculate the piston trajectory, the compression waves in front of and behind the piston, and the trajectories of reflected compression waves. Approximate formulas for these calculations with a pocket calculator are presented. Tables and diagrams give information about the relations describing the operation of the shock tube with pure monoatomic and biatomic gases. These relations are used to determine optimal ratios between the length of the high pressure tube, launching tubes and measuring tube in front of and behind the piston initial position. Author (ESA)

N85-24261# Institut Franco-Allemand de Recherches, St. Louis (France).

UNSTEADY FLOWS IN A TUBE WITH COMBUSTION REACTION [NICHTSTATIONAERE ROHRSTROEMMUNGEN MIT VERBRENNUNG]

G. Krauth 7 Jul. 1983 86 p refs In GERMAN

(ISL-R-118/83) Avail: NTIS HC A05/MF A01

A method for the calculation of flow field and piston motion for unsteady tube flows with combustion is treated. The principal relations of thermodynamics and an introduction to the Abel state equation are presented. The equations are applied to a homogeneous two-phase mixture. Using the streamline theory for flows in tubes with small cross section variations, the unsteady balance equations for friction and heat-conduction-free flows with mass and energy supply are simplified. Simple equations for a homogeneous mixture of gas and particles in which the two phases have equal velocity are obtained. Based on these equations and the approximation of a perfect entrainment of the propulsion powder by the gaseous flow, a simulation model for the interior ballistics phenomena is developed. For the numerical solution a characteristics method in Lagrangian coordinates is proposed, supposing a spatially and temporally uniform ignition of the propulsion powder. Taking into account the simplifications of the model, the numerical results agree well with the known characteristics of the utilized materials. Author (ESA)

N85-24262# Institut Franco-Allemand de Recherches, St. Louis (France).

MEASUREMENT OF THE EXPANSION VELOCITY OF AN AEROSOL CLOUD DURING PYROTECHNICAL DISPERSION [GESCHWINDIGKEITSMESSUNGEN IN EINER AEROSOLWOLKE WAEHREND DER PYROTECHNISCHEN ZERSTAEUBUNG]

G. Smeets and M. Samirant 23 Sep. 1983 27 p refs In GERMAN Original contains color illustrations

(Contract DRET-81/530)

(ISL-R-125/83) Avail: NTIS HC A03/MF A01

Velocity measurements were conducted on particles using laser Doppler velocimetry in order to analyze the expansion phenomenon of an aerosol cloud during the pyrotechnical dispersion of the combustible. It is shown that the flow state and combustible distribution of the cloud are very irregular, because under the influence of the dispersive charge the receptacle containing the combustible opens in a very irregular, irreproducible way, fragmenting in relatively large splinters. In the time interval between 10 and 30 msec after the ignition of the dispersive charge, the major part of the cloud shows a radially outward expansion motion whose mean velocity is 25 m/sec. Author (ESA)

N85-24263# Institut Franco-Allemand de Recherches, St. Louis (France).

FEASIBILITY STUDY OF AN INSTALLATION TO SIMULATE THE FLOW OF PROPELLANT GASES IN A GUN BARREL, PART 2 Final Report [DURCHFUEHRBARKEITSSTUDIE ZUM BAU EINER ANLAGE ZUR SIMULATION DER TREIBGASSTROEMUNG IN EINEM WAFFENROHR, 2]

H. Mach, U. Werner, and H. Masur 19 Dec. 1983 38 p ref In GERMAN

(Contract BMVg-T/R-760/D-0013/D-1713)

(ISL-R-128/83-Pt-2) Avail: NTIS HC A03/MF A01

Measures to improve the simulation properties of a light-gas gun are described. By varying the propellant powder quantity and the filling pressure, the maximum pressure range (1000 to 3500 bar), the volume corresponding to this pressure (60 to 200 cc) and the projectile velocity (800 to 1000 m/sec) are measured. The gas temperature cannot be measured. The temperature is 1500 K, substantially lower than that existing in the propellant gas flow to be simulated. The propulsive piston and the compression tube were modified to obtain compression without shock wave effects and a braking of the piston such that the volume between the piston and the projectile base fulfills the specified conditions. Author (ESA)

N85-24264# Institut Franco-Allemand de Recherches, St. Louis (France).

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE MOTION OF PARTICLES IN A COMPRESSIBLE VORTEX [EXPERIMENTELLE UND THEORETISCHE UNTERSUCHUNG DER PARTIKELBEWEGUNG IN EINEM KOMPRESSIBLE WIRBEL]

W. Jaeger and A. George 21 Jan. 1983 52 p refs In GERMAN

(ISL-R-129/83) Avail: NTIS HC A04/MF A01

Entrainment of particles in a compressible, two dimensional vortex behind a ridge in a shock tube was studied by laser anemometry. The density field was visualized by interferometric measurements. The flow velocity is measured in a fixed place as a function of time, particle size and density. A Michelson interferometer with different arm length visualized the velocity field by interference fringe shifts, and simultaneously gave particle distribution in the vortex at a fixed time. The certainty with which turbulent flows can be visualized, especially flows in boundary

layer and mixing layers is determined. The significance of the flow contour lines when the particles cannot follow the flow is shown. The measured data are compared with numerical simulation calculations using simple relations from the literature to determine velocities and densities in the vortex. Particle motion first approximations calculated using the Stokes resistance law agree well with the experiemental results. Author (ESA)

N85-24265# Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION POSSIBILITIES OF LASER DOPPLER ANEMOMETRY IN THE INVESTIGATION OF THE TRANSONIC INTERACTION BETWEEN SHOCK WAVE AND BOUNDARY LAYER [EINSATZMOEGLICHKEITEN DER LASER-DOPPLER-ANEMIMETRIE BEI DER UNTERSUCHUNG DER TRANSSONISCHEN WECHSELWIRKUNG ZWISCHEN VERDICHTUNGSSTOSS UND GRENZSCHICHT]
H. J. Schaefer, G. Horny, H. J. Pfeifer, and E. Stanewsky 7 Dec. 1983 53 p refs In GERMAN
(ISL-R-131/83) Avail: NTIS HC A04/MF A01

A laser Doppler anemometer was used in a transonic wind tunnel to investigate the flows about wing profiles containing shock waves and separated zones. Flow states characterized by the absence or the presence of a shock-induced separation were created. The results of the laser anemometry are presented in the form of two-dimensional Mach number distributions. The good agreement with analogous results obtained by classical probe measurements and model calculations indicate that the laser anemometer can be successfully utilized for the quantitative analysis of shock-boundary layer interferences about transonic wing profiles. Author (ESA)

N85-24266# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hardthausen (West Germany). Abt. Brennertechnologie.
MASS AND HEAT TRANSFER IN REFLUX CONDENSERS OF ABSORPTION HEAT PUMPS
Robert Mack Jul. 1984 41 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-912)
(DFVLR-FB-83-43; ISSN-0171-1342; ESA-TT-912) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 15.50

An equation to calculate horizontal reflux condensers was deduced. It makes mass and heat transfer computable depending on known numerical values of the process variables. The equation is demonstrated by experiments with two absorption heat pumps working with ammonia water solution. Parameter studies are made with a computer program to show the different dependences and to guarantee an efficient construction. The program is extended to allow the computation of other than nominal conditions. Computation and test results show good agreement. Author (ESA)

N85-24267# National Aerospace Lab., Amsterdam (Netherlands). Ruimtevaart Hoofdafdel.
RADIATION HEAT TRANSFER WITHIN AN OPEN-CYCLE MHD GENERATOR CHANNEL
A. A. M. Delil 25 May 1983 55 p refs In DUTCH; ENGLISH summary
(Contract BEOP-4.311/oc-12)
(NLR-TR-83068-U; B8477220; AD-B069471L) Avail: NTIS HC A04/MF A01

Radiation heat transfer in an MHD generator was modeled using the Sparrow and Cess model for radiation in an emitting, absorbing and scattering medium. The resulting general equations can be considerably reduced by introducing simplifying approximations for the channel and MHD gas properties. The simplifications lead to an engineering model, which is very useful for one-dimensional channel flow approximation. The model can estimate thermo-optical MHD gas properties, which can be substituted in the energy equation. The model considers the contribution of solid particles in the MHD gas to radiation heat transfer, considerable in coal-fired closed cycle MHD generators. The modeling is applicable also for other types of flow at elevated temperatures, where radiation heat transfer is an important quantity. Author (ESA)

N85-24068# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF HEAT TRANSFER FROM SHAFT IN COOLED RADIAL BEARING OF GNT-25 GAS TURBINE Abstract Only
V. V. Rukhlinskiy, I. D. Usayev, and A. V. Yermolenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 36-37 Transl. into ENGLISH from Teploenerg. (Moscow), no. 4, Apr. 1983 p 64-66 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24103# Joint Publications Research Service, Arlington, Va.
FLOW AROUND AXISYMMETRIC BODIES WITH UNIFORM-VELOCITY ZONES Abstract Only
L. A. Kozhuro *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 68-69 Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Novosibirsk), no. 4, Jul. - Aug. 1983 p 63-67 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24105# Joint Publications Research Service, Arlington, Va.
WAVE MOTION OF THREE-COMPONENT MEDIUM UNDER LOAD MOVING ON PLANE BOUNDARY Abstract Only
Kh. A. Rakhmatulin and A. K. Dzhashakuyeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 70 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat. Mekhan. (Moscow), no. 4, Jul. - Aug. 1983 p 100-103 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24106# Joint Publications Research Service, Arlington, Va.
DEPENDENTS OF VELOCITY DISTRIBUTION IN EXIT SECTION OF CONVERGING CHANNEL ON SHAPE OF INLET CHANNEL IN REGULATING VALVE Abstract Only
A. Ye. Zaryankin, L. G. Golovina, and V. A. Seregin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 71 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 6, Jun. 1983 p 12-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24109# Joint Publications Research Service, Arlington, Va.
TURBULENT FLOW AROUND CIRCULAR CYLINDER UNIFORMLY ROTATING IN INFINITE INCOMPRESSIBLE FLUID Abstract Only
V. V. Novozhilov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 72-73 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 6, Oct. 1983 p 1322-1326 Original language was announced in IAA as A84-14872 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24111# Joint Publications Research Service, Arlington, Va.
HYDRAULIC DRAG OF ROD WITH ARTIFICIAL MICROROUGHNESS IN LONGITUDINAL FLOW Abstract Only
V. L. Lulchuk, V. P. Smirnov, K. P. Shuyskaya, A. G. Sorokin, and A. V. Turkin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 74 Transl. into ENGLISH from Teploenerg. (Moscow), no. 7, Jul. 1983 p 46-48 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24112# Joint Publications Research Service, Arlington, Va.
STABILITY OF STEADY ROTATION OF A CYLINDER FILLED WITH A STRATIFIED VISCOUS INCOMPRESSIBLE FLUID Abstract Only
N. V. Derendyayev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 74 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 272, no. 5, Sep. 1983 p 1073-1076 Previously announced as N84-32054 (For primary

document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24113# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TURBULENCE OF INCIDENT STREAM ON THREE DIMENSIONAL BOUNDARY LAYER Abstract Only
V. V. Burlaka and Yu. V. Grechanichenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 75 Transl. into ENGLISH from Teploenerg. (Moscow), no. 7, Jul. 1983 p 62-64 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24116# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF SOLID BODY WITH ELLIPSOIDAL CAVITY CONTAINING MAGNETIC FLUID Abstract Only
O. I. Bogoyavlenskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 77 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 440-445 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24175# Joint Publications Research Service, Arlington, Va.
CALCULATING ISOTHERMAL FLOW IN WAKE BEYOND INJECTION ZONE Abstract Only
N. M. Krutova and T. A. Mityushkina *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 41 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 42-45 Original language doc. was announced in IAA as A84-14258 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24177# Joint Publications Research Service, Arlington, Va.
CALCULATING BOUNDARY LAYER ON PROFILE WITH LAMINAR AND TURBULENT FLOW ZONE Abstract Only
V. D. Sovershennyy and V. A. Aleksin *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 68-72 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24469# Joint Publications Research Service, Arlington, Va.
MODELING OF SHEAR FLOW IN A STRATIFIED FLUID Abstract Only
A. M. Batchayev, V. A. Dovzhenko, and M. V. Kurganskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 42 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 451-455 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-24268*# National Aeronautics and Space Administration, Washington, D. C.
SEVEN-WAVELENGTH PYROMETER FOR DETERMINING SURFACE TEMPERATURE OF ABLATION MATERIALS
Huang Yi Apr. 1985 8 p refs Transl. into ENGLISH from Acta Aerodyn. Sinica (China), no. 1, 1984 p 106-109 Original language document was announced in IAA as A84-37913 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-77832; NAS 1.15:77832) Avail: NTIS HC A02/MF A01 CSCL 14B

Results which were achieved by a seven-wavelength pyrometer last year are reported in this paper. These studies are directed toward the development of a method for determining the real surface temperature of thermal protection materials and for evaluating its emittance under varieties of reentry environment. A description of the data processing method and apparatus is also included. Author (IAA)

N85-24269*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GEOMETRIC ERROR ANALYSIS FOR SHUTTLE IMAGING SPECTROMETER EXPERIMENT
Shyh Jong Wang and Che-Hang Charles Ih 15 Dec. 1984 172 p refs
(Contract NAS7-918)
(NASA-CR-175665; JPL-Pub-85-2; NAS 1.26:175665) Avail: NTIS HC A08/MF A01 CSCL 14B

The demand of more powerful tools for remote sensing and management of earth resources steadily increased over the last decade. With the recent advancement of area array detectors, high resolution multichannel imaging spectrometers can be realistically constructed. The error analysis study for the Shuttle Imaging Spectrometer Experiment system is documented for the purpose of providing information for design, tradeoff, and performance prediction. Error sources including the Shuttle attitude determination and control system, instrument pointing and misalignment, disturbances, ephemeris, Earth rotation, etc., were investigated. Geometric error mapping functions were developed, characterized, and illustrated extensively with tables and charts. Selected ground patterns and the corresponding image distortions were generated for direct visual inspection of how the various error sources affect the appearance of the ground object images. Author

N85-24270*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEASUREMENTS IN THE FLOW FIELD OF A CYLINDER WITH A LASER TRANSIT ANEMOMETER AND A DRAG RAKE IN THE LANGLEY 0.3 m TRANSONIC CRYOGENIC TUNNEL
William C. Honaker and Pierce L. Lawing Apr. 1985 25 p refs
(NASA-TM-86399; NAS 1.15:86399) Avail: NTIS HC A02/MF A01 CSCL 14B

An experiment was conducted at the 0.3 m Transonic Cryogenic Tunnel using a Laser Transit Anemometer (LTA) to probe the flow field around a 3.05 centimeter-diameter circular cylinder. Measurements were made along the stagnation line and determination of particle size was evaluated by their ability to follow the flow field. The LTA system was also used to scan into the boundary layer near the 45 degree point on the model. Results of these scans are presented in graphic and tabular form. Flow field particle seeding was accomplished by inbleeding dry service air. The residual moisture (5-10 ppm) condensed and formed ice particles which served as Mie scattering centers for the LTA detection system. Comparison of data taken along the stagnation streamline with theory indicated that these particles tracked the velocity gradient of the flow. Tunnel operating conditions for the tests were a Mach number of 0.3, a pressure of 1.93 x 100000 n/m squared, and a temperature of 225 degrees K. Free stream Mach number and pressure were varied for the particle size determination. Author

N85-24271*# Lockheed Missiles and Space Co., Palo Alto, Calif.
ULTRAVIOLET SPECTROMETER AND POLARIMETER (UVSP) SOFTWARE DEVELOPMENT AND HARDWARE TESTS FOR THE SOLAR MAXIMUM MISSION Interim Report, 1 Jul. - 30 Sep. 1984
30 Sep. 1984 12 p
(Contract NAS5-24119)
(NASA-CR-175279; NAS 1.26:175279; Rept-D/197) Avail: NTIS HC A02/MF A01 CSCL 14B

An analysis of UVSP wavelength drive hardware, problems,

and recovery procedures; radiative power loss from solar plasmas; and correlations between observed UV brightness and inferred photospheric currents are given. B.G.

N85-24272# University Coll. of North Wales, Bangor. School of Electronic Engineering.
PIEZOELECTRIC AND ELECTROSTATIC POLYMERIC TRANSDUCERS FOR ACOUSTIC EMISSION DETECTION Final Technical Report, Dec. 1982 - Jun. 1984
D. K. Das-Gupta and K. Doughty Dec. 1984 36 p
(Contract DAJA45-83-C-0008; DA Proj. 1T1-61102-BH-57)
(AD-A150883; TR-4) Avail: NTIS HC A03/MF A01 CSCL 09/1

The work performed during the contractural period falls into three distinct parts: (1) the fabrication of ultrasonic transducers for acoustic emission detection using polyvinylidene fluoride (PVDF) active elements, (2) the fabrication of electrostatic transducers using thin films of non-polar polymers such as polypropylene and polytetrafluoroethylene, and (3) the development of a flexible composite material with piezoelectric properties using powdered ceramic (PZT) dispersed in a polymer matrix. The first period report dealt with the design and characterization of PVDF transducers. The second report compared the sensitivity of PVDF transducers with polypropylene electrostatic transducer designs. Further work performed to determine optimum charging conditions for high sensitivity and repeatability of electrostatic responses was described in the third report. This report briefly describes the work performed over the entire project and then describes, in detail, the development and piezoelectric characterization of a flexible composite material which may be used for acoustic emission monitoring applications. GRA

N85-24273# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
THERMOCOUPLE MODELING
M. O. Fryer 1984 8 p refs Presented at Intern. Conf. on Power Mexico City, 19 Nov. 1984
(Contract DE-AC07-76ID-01570)
(DE85-005172; EGG-M-22484; CONF-841115-7) Avail: NTIS HC A02/MF A01

The temperature measurements provided by thermocouples (TCs) are important for the operation of pressurized water reactors. During severe inadequate core cooling incidents, extreme temperatures may cause type K thermocouples (TCs) used for core exit temperature monitoring to perform poorly. A model to TC electrical behavior has been developed to determine how TCs react under extreme temperatures. The model predicts the voltage output of the TC and its impedance. A series of experiments were conducted on a length of type K thermocouple to validate the model. Impedance was measured at several temperatures between 22 C and 1100 C and at frequencies between dc and 10 MHz. The model was able to accurately predict impedance over this wide range of conditions. The average percentage difference between experimental data and the model was less than 6.5%. Experimental accuracy was + or - 2.5%. There is a striking difference between impedance versus frequency plots at 300(0)C and at higher temperatures. This may be useful in validating TC data during accident conditions. DOE

N85-24274# Institut Franco-Allemand de Recherches, St. Louis (France).
OMEGA: AN OPTRONIC DEVICE TO MEASURE THE INCIDENCE ANGLE OF A PROJECTILE [OMEGA: UN DISPOSITIF DE MESURE OPTRONIQUE DE L'ANGLE D'INCIDENCE D'UN PROJECTILE]
K. Sterzelmeier 13 Apr. 1983 22 p refs In FRENCH Presented at Ger. Phys. Soc. Conf. on Phys. des Phenomenes Ultra-Rapides, Ratisbonne, West Germany, 14-18 Mar. 1983
(ISL-CO-207/83) Avail: NTIS HC A02/MF A01

Measurement instruments for application to terminal ballistics are studied. The classical methods to determine the angular position of a projectile just before impact are reviewed. The implementation and principles of operation of four optronics procedures are described, including the utilization of lateral photodiodes and diode arrays under single or multiple laser beam illumination. Results show that these methods can present a resolution power of 0.2 deg. Author (ESA)

N85-24275# Institut Franco-Allemand de Recherches, St. Louis (France).
UTILIZATION OF MICROCHANNEL PLATES IN THE FLASH X-RAY TECHNIQUE [ANWENDUNG VON MICROCHANNEL-PLATES IN DER RÖTGENBLITZTECHNIK]
T. Ebding 5 Sep. 1983 12 p In GERMAN Presented at Soc. Allemande de Phys. Comm. on Phys., Ratisbonne, West Germany, 14-18 Mar. 1983
(Contract BMVg-T/R-760/D-0005/D-1705)
(ISL-CO-228/83) Avail: NTIS HC A02/MF A01

The detection sensitivity of channel plates was investigated at an average X-ray energy of 150 kV. For 150 kV radiation the probability that an absorbed X-ray quantum triggers an electron avalanche is 40%, leading to a global detection sensitivity of 5%. The characteristics of microchannel plates for short intense X-ray pulses are described. Channel plates have decisive advantages as X-ray detectors: they can be used as detector and amplifier in the energy range from a few keV up to MeV, they have good geometrical and time resolution, and high amplification. Saturation effects only occur at 10 million quanta/sq cm. At extremely low intensities (crystallography) channel plates are very promising detectors. Disadvantages are the high price and operation in vacuum. Author (ESA)

N85-24276# Institut Franco-Allemand de Recherches, St. Louis (France).
INTERFEROMETRIC VELOCITY MEASUREMENTS IN BALLISTICS [INTERFEROMETRISCHE GESCHWINDIGKEITSMESSUNGEN IN DER BALLISTIK]
G. Smeets 7 Dec. 1983 26 p refs In GERMAN Presented at Conf. on Performation et Blindage, Weil am Rhein, West Germany, 25 Jan. 1984
(ISL-CO-239/83) Avail: NTIS HC A03/MF A01

Ways to determine velocities and changes in position of bodies and surfaces by the interference between two light waves or wave fields are presented. The interferometric velocity measuring technique is explained. Three interferometric methods are discussed and application examples in ballistics are discussed. Double-pulse holography gives visual information about changes in the position of objects during a time interval. The laser Doppler velocimeter registers the velocity evolution of object points in real time. The Velocity Interferometer System for Any Reflector can replace the laser Doppler velocimeter if the time resolution is < 0.1 microsec. Author (ESA)

N85-24277# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SMALL APERTURE ANALYSIS OF THE DUAL TEM (TRANSVERSE ELECTROMAGNETIC) CELL AND AN INVESTIGATION OF TEST OBJECT SCATTERING IN A SINGLE TEM CELL
P. F. Wilson and M. T. Ma Oct. 1984 63 p refs
(PB85-159952; NBS/TN-1076) Avail: NTIS HC A04/MF A01; also available SOD CSCL 14B

Small aperture theory is used to investigate the dual transverse electromagnetic (TEM) cell. Analyzing coupling through an empty versus a loaded aperture leads to a model of dual TEM cell shielding effectiveness measurements. Small obstacle scattering yields results for both the field perturbation and the change in a cell's transmission line characteristics due to the presence of a test object in a TEM cell. Theoretical values are compared to experimental data. GRA

N85-23739*# Spectron Development Labs., Inc., Costa Mesa, Calif.
ADVANCE PARTICLE AND DOPPLER MEASUREMENT METHODS
Chris Busch *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 54-55 (For primary document see N85-23729

14-03)
Avail: NTIS HC A07/MF A01 CSCL 14B

N85-24045# Joint Publications Research Service, Arlington, Va.
SMALL-SIZE MEASURING GAUGES FOR METAL CUTTING MACHINE TOOLS Abstract Only
B. M. Levin, V. N. Lyapkov, Yu. A. Myasnikov, and L. N. Kirsanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 22 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 19-21 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24065# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AXIAL SHAFT LOAD ON OPERATION OF MAGNETOELASTIC TORQUE TRANSDUCER Abstract Only
S. D. Levintov and A. G. Kostylev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 27-31 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24079# Joint Publications Research Service, Arlington, Va.
DESIGN OF SINGLE-WHEEL GYROCOMPASS WITH CORRECTION Abstract Only
L. M. Ryzhkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 45 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 5, May 1983 p 50-53 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24082# Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMUM CORRECTIONS TORQUE FOR VERTICAL GYRO ACCORDING TO SPECIAL-PURPOSE PROGRAM Abstract Only
A. A. Kubenskiy, M. A. Sergeyev, and V. A. Yablonskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 47 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 50-53 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24083# Joint Publications Research Service, Arlington, Va.
PRECISE MOUNTING OF INSTRUMENTS IN UNIVERSAL SUSPENSION WITH SKEWED AXES Abstract Only
N. F. Perkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 47-48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 47-50 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24084# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF HYPERSTABLE CONTROL SYSTEM WITH ADAPTIVE MODEL Abstract Only
G. S. Chkhartishvili and V. B. Berezin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 7, Jul. 1983 p 30-33 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24085# Joint Publications Research Service, Arlington, Va.
POSITIONING ERRORS OF COMMUTATING LENSES AND THEIR INFLUENCE ON CHARACTERISTICS OF HIGH SPEED MOVIE CAMERAS
A. V. Nikulin, S. G. Okishev, and A. A. Tsukanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 49-56 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 25, no. 7, Jul. 1983 p 83-89 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24130# Joint Publications Research Service, Arlington, Va.
TRANSDUCER OF LINEAR DISPLACEMENTS Abstract Only
Ye. R. Malamed *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) . 9 Feb. 1984 p 86 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 35-37 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24135# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR AUTOMATIC RECORDING OF VIBRATION PARAMETERS Abstract Only
B. I. Fedorov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 89 Transl. into ENGLISH from Vestn. Mashinostroyeniye (Moscow), no. 9, Sep. 1983 p 25 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24139# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ERRORS OF ACOUSTIC GONIOMETER INFORMATION-MEASUREMENT SYSTEMS ON ROCKING BASE Abstract Only
I. Ya Naumenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 92 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 7-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24171# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF DIRECTIONAL GYRO PARAMETERS
V. A. Pavlov *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 33-37 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborost. (Leningrad), v. 27, no. 1, Jan. 1984 p 59-62 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24192# Joint Publications Research Service, Arlington, Va.
NEW ELECTRONIC MEASUREMENT, CONTROL DEVICES
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 37-41 refs Transl. into ENGLISH from Pomiary Automatyka Kontrola (Warsaw), no. 11, Nov. 1984 p 342-346 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

N85-24352# Department of Environment, Ottawa (Ontario). Atmospheric Environment Service.
THE EDMONTON DATA COLLECTION PLATFORM PROCESSING AND LOCATING FACILITY
Colin S. diCenzo *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 7 p refs (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24358# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. Data Buoy Office.
US PROGRAM IN ANCHORED DATA BUOY AND THE OTHER FIXED OBSERVATION PLATFORMS
Jerry C. McCall *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 11 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24778 Centre National d'Etudes Spatiales, Toulouse (France).
CLOCK SYNCHRONIZATION BY THE SYMPHONIE AND LASER SYNCHRONIZATION FROM STATIONARY ORBIT (LASSO) GEOSTATIONARY SATELLITES [SYNCHRONISATION D'HORLOGES PAR SATELLITES GEOSTATIONAIRES SYMPHONIE, LASSO]
Michel Brunet *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 905-933 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-24278 Welding Inst., Cambridge (England).
LASER WELDING, CUTTING AND SURFACE TREATMENT
1984 63 p refs
Copyright. Avail: Issuing Activity

A review of laser applications in various fields of industrial manufacturing is presented. Topics range from laser tooling and compatibility to laser machine work such as cutting, drilling and welding. For individual titles, see N85-24279 through N85-24291.

N85-24279 Welding Inst., Cambridge (England).
APPLICATIONS OF LASERS IN MANUFACTURING
R. C. Crafer *In its* Laser Welding, Cutting and Surface Treat. 1984 p 1-4 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

A brief overview of the applications of lasers to industry is presented. The applications mentioned include: (1) printing and engraving; (2) machining (includes cutting, drilling, scribing, etc.); (3) welding; (4) heat treatment; and (5) secondary applications such as: (a) meteorology and surveying; (b) optical communications; and (c) remote sensing. G.L.C.

N85-24280 Welding Inst., Cambridge (England).
TRENDS IN LASER EQUIPMENT
I. J. Spalding, A. S. Kaye, and B. A. Ward *In its* Laser Welding, Cutting and Surface Treat. 1984 p 5-8 refs Sponsored in part by the Dept. of Industry (For primary document see N85-24278 14-36)
Avail: Issuing Activity

A range of commercially available axial flow CO2 lasers having mean powers of < 2kW are normally used for machining or welding nonmetals and steels up to a few millimeters thick. For work at higher powers several continuously rated multikilowatt transverse flow CO2 lasers have been developed. Four industrially rated 5kW(CL5) units have been run routinely on a single-shift basis with a cumulative life already exceeding 13,000 hr. At full power not less than 80% of the beam can be focused into a spot diameter of 0.3mm, using f/4 spherical optics. Near-field and far-field burn patterns on perspex provide qualitative evidence of the very clean transverse mode structure. More precise online measurements at a range of axial position have been made using a beam-scanning quality assurance unit. G.L.C.

N85-24281 Welding Inst., Cambridge (England).
SAFETY WITH INDUSTRIAL MANUFACTURING LASERS
W. I. Holmes *In its* Laser Welding, Cutting and Surface Treat. 1984 p 9-12 ref (For primary document see N85-24278 14-36)
Avail: Issuing Activity

A review of British safety standards relative to lasers in the industrial workplace is presented. Classification of laser outputs according to wavelength and power and the necessary precautions to be taken when employing them in industrial production situations are examined. G.L.C.

N85-24282 Welding Inst., Cambridge (England).
AN ANALYSIS OF MACHINE TOOL SYSTEMS SUITABLE FOR LASER PROFILING
J. Leece *In its* Laser Welding, Cutting and Surface Treat. 1984 p 13-17 ref (For primary document see N85-24278 14-36)
Avail: Issuing Activity

There are basic parameters which help to determine the type of machine which should be used in conjunction with CO2 laser to perform a specific function. Cutting speed and the complexity of the components to be produced are two of the major determining factors. These factors also determine other parameters governing the entire system configuration. G.L.C.

N85-24283 Welding Inst., Cambridge (England).
THE MEASUREMENT OF LASER BEAM PARAMETERS
P. J. Oakley *In its* Laser Welding, Cutting and Surface Treat. 1984 p 18-22 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

Measurement of beam parameters can be made by using the total beam, or by sampling a known factor of the beam. Measurement of the total beam is the simplest technique but has the disadvantage that measurements are not available while material processing is in progress. Three methods of sampling part of the beam, usually a few per cent, are described. As a small sample of the beam is monitored, techniques with lower power capabilities can be used. All three provide the advantages of monitoring the beam while it is at the workstation, but can reduce the accuracy of measurement because of uncertainties in the fraction of the beam sampled. Each of the three methods has additional disadvantages. G.L.C.

N85-24284 Welding Inst., Cambridge (England).
LASER SURFACE TREATMENTS
J. H. P. C. Megaw *In its* Laser Welding, Cutting and Surface Treat. 1984 p 23-27 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

The coherent nature of laser light yields the ability to focus it to very high power densities, and effective use of a laser requires applications suited to a very localized heat source. The advantages of a high power density source for all these localized surface treatments may be deduced from the peak temperature profiles in a workpiece arising from both high and low intensity heating fluxes. (For example, the case hardening of steel requires an outer layer to be raised above approximately 800 C, while holding the surface below melting temperature). Use of high intensity flux results in much less component heating and much higher cooling rates, for example obviating the need for external quenchant. G.L.C.

N85-24285 Welding Inst., Cambridge (England).
LASER CUTTING: A NEW TOOL FOR SHIPBUILDING
D. R. Martyr *In its* Laser Welding, Cutting and Surface Treat. 1984 p 28-32 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

Cutting steel plate from 3 to 10mm thick by the oxygen-propane process leads to severe thermal distortion in profile-cut components. This distortion makes ship prefabrication and welding very difficult and expensive. Laser cutting, however, is characterized by its ability to produce a clean edge with very low heat input, at high speeds. The way in which a laser cutting system was designed, evaluated, and subsequently built for large steel plate profile cutting in a small warship-building facility, to improve quality and to reduce production costs is reviewed. G.L.C.

N85-24286 Welding Inst., Cambridge (England).
LASER WELDING IN THE MANUFACTURE OF HEART PACEMAKERS
G. W. G. Janssen *In its* Laser Welding, Cutting and Surface Treat. 1984 p 33-35 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

Laser welding has become a key process in the manufacture of pacemakers but there are more powerful arguments than that for the use of lasers: (1) The laser is a most refined welding tool; (2) The laser simplifies pacemaker design; and (3) Laser welding is readily adapted to CNC control. G.L.C.

N85-24287 Welding Inst., Cambridge (England).
LASER SPOT WELDING IN THE ELECTRONICS INDUSTRY
G. J. A. M. Notenboom *In its* Laser Welding, Cutting and Surface Treat. 1984 p 36-39 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

In the past laser welding has often been proposed as a means to weld exotic materials, but in practice it can compete directly with resistance welding for a variety of more common mass production applications. Its advantages are: (1) There are no electrodes, hence no wear and maintenance problems; (2) There

is no deformation of the parts to be welded, since no welding force is involved; (3) Parts tend to become smaller and smaller in the electronics industry and for that reason a contactless joining technique is preferable; (4) The weld is more accessible. For similar reasons the positioning of parts to be welded becomes more and more complex, and the production engineer is hardly able to find the space needed for the welding electrodes; and (5) Electrical conductance is not involved, which implies that there is less influence on the weld of oxide layers and oil films. G.L.C.

N85-24288 Welding Inst., Cambridge (England).
LASERS IN AUTOMOBILE PRODUCTION
P. Pizzi *In its* Laser Welding, Cutting and Surface Treat. 1984 p 40-42 (For primary document see N85-24278 14-36)
Avail: Issuing Activity

There is a trend in mechanical equipment to replace complicated mechanical components with electronics, especially microprocessors, laser technology represents an important new tool. The effects of laser technology can be seen in production systems concerned with cutting, welding, heat treatment, and the alloying of mechanical components. Applications in the automobile industry today are not very widespread and are concerned essentially with welding and cutting. G.L.C.

N85-24289 Welding Inst., Cambridge (England).
LASERS IN THE NUCLEAR INDUSTRY
R. Johnson *In its* Laser Welding, Cutting and Surface Treat. 1984 p 43-47 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

The United Kingdom Atomic Energy Authority is currently using lasers with power capabilities of less than 1mW to greater than 15kW continuous wave (CW) output, together with ultrahigh energy single pulse lasers, in the plasma research associated with fusion power. The lower power lasers are used for inspection, alignment, and diagnostic purposes, but in the range 100W-15kW several lasers are in operation in production plant or in research laboratories to assess the feasibility of further production uses. G.L.C.

N85-24290 Welding Inst., Cambridge (England).
LASER DRILLING OF AEROENGINE COMPONENTS
D. F. Toller *In its* Laser Welding, Cutting and Surface Treat. 1984 p 48-51 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

The solid state YAG laser has proved itself to be a useful tool for drilling, cutting, and welding aeroengine materials. It has advantages both as a production process, where its lower consumable costs and faster floor to floor times over other techniques make it the first choice for many applications, and also as a development tool where its ease of programming and absence of major tooling and fixturing enable it to respond rapidly to design changes. These factors, together with the high quality holes now being produced by the trepanning technique, mean that this process has developed into a reliable cost effective production technique. G.L.C.

N85-24291 Welding Inst., Cambridge (England).
FUTURE TRENDS IN THE USE OF LASERS IN MANUFACTURING
R. C. Crafer *In its* Laser Welding, Cutting and Surface Treat. 1984 p 52-58 refs (For primary document see N85-24278 14-36)
Avail: Issuing Activity

The LMS, comprising laser generator, laser/workpiece link, beam and work handling, and control systems was reviewed. The main system features were examined and areas suggested in which improvements are most likely to occur. G.L.C.

N85-24292*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SCALING BLACKBODY LASER TO HIGH POWERS
R. J. DeYoung Mar. 1985 17 p refs
(NASA-TM-86395; NAS 1.15:86395) Avail: NTIS HC A02/MF A01 CSCL 20E

Lasers pumped by solar heated blackbody cavities have potential for multimegawatt power beaming in space. There are two basic types of blackbody lasers; cavity pumped and transfer system. The transfer system is judged to be more readily scalable to high power. In this system, either N2 or CO is heated by the blackbody cavity then transferred into the laser cavity where CO2 is injected. The N2-CO2 system was demonstrated, but probably has lower efficiency than the CO-CO system. The characteristics of potential transfer laser systems are outlined. Author

N85-24293# University of Southern California, Los Angeles. Dept. of Chemistry.
OBSERVATION OF PURE RESONANCE AND THRESHOLD EFFECTS IN ELECTRON IMPACT EXPERIMENTS IN HIGH INTENSITY LASER FIELDS Final Report, 1 Apr. 1982 - 30 Sep. 1984
R. McAdams, H. S. Taylor, and S. Trajmar Dec. 1984 61 p
(Contract N00014-82-K-0330)
(AD-A150725) Avail: NTIS HC A04/MF A01 CSCL 20/8

This report describes experiments which were aimed to: (1) observe induced one photon free-free transitions associated with electron scattering by rare gas atoms in a CO2 laser field; (2) observe resonances in the free-free channel under experimental conditions when direct scattering is eliminated (by making the electric polarization vector and the momentum transfer vector perpendicular to each other). We have detected free-free transitions associated with elastic scattering by Ar and Xe at 141 and 90 deg scattering angles, respectively, using incident electron energies near resonances. Resonances in the elastic channel were readily observed for He, Ar and Xe but due to poor statistics, we were not able to demonstrate the resonances in the free-free channels. There was indication, however, that (in agreement with the soft photon approximation) the free-free direct scattering amplitude was zero when the laser polarization direction was perpendicular to the momentum transfer direction. On the basis of our studies, it was concluded, that (although the aims described above could be achieved with our apparatus) it would require much more time, than presently is available to us, to demonstrate the effects with proper signal to noise conditions. Author (GRA)

N85-24294# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
PICOSECOND LIDAR TECHNIQUES IN LABORATORY AND FIELD DIAGNOSTICS Final Report, 1 Nov. 1982 - 15 Jan. 1984
R. Goulard 17 Dec. 1984 8 p
(Grant AF-AFOSR-0016-83)
(AD-A150755; AFOSR-85-0085TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

The availability of picosecond laser systems opens a new potential in the field of diagnostics. It is now possible to observe chemical events over time intervals as short as 10 to the minus 9th power sec (e.g., fluorescence, bond-selective chemistry,...) without overlap with the much shorter 10 to the minus 12th power sec triggering signal. In addition, two specific effects are of special interest to real industrial flame diagnostics. One is the elimination of background noise, since the picosecond time-gating of the detector will collect the whole signal of interest but only a tiny fraction of the time-spread noise background (e.g., soot, walls,...). The other is related to the very short length of these pulses (similar to mm): it is the possibility to use the lidar/radar principle to convert the time history of the measured back scattered signals into a millimeter-resolved space distribution along the beam. In this fashion, Raman and other techniques can yield a detailed map of concentrations and temperatures in three-dimensional space, even in sooty combustors background, with the need of only one single porthole. GRA

N85-24295# Naval Postgraduate School, Monterey, Calif.
GROUND-UP-TO-SPACE (GUTS) LASER PROPAGATION CODE DESCRIPTION AND MANUAL M.S. Thesis
J. S. Morrow Jun. 1984 142 p
(AD-A150783; NPS67-84-008) Avail: NTIS HC A07/MF A01 CSCL 09/2

GUTSAVG is a high energy laser propagation program for ground-to-space applications. Written by Dr. C. B. Hogge from the Air Force Weapons Laboratory, Kirtland AFB, it is one in a family of propagation codes addressing this application. Specifically, GUTSAVG was designed to compute irradiance at the target given a model atmosphere, laser device parameters, and simple target engagement geometry. The transmitter induced effects of beam quality and jitter are considered as are the linear atmospheric effects of scattering, absorption, and turbulence. A thermal blooming model is also included. Adaptive optics compensation can be applied with consideration given to isoplanatic effects. GRA

N85-24296# Stanford Univ., Calif. Lab. of Physics.
STUDIES ON RADIATIVE COLLISIONAL AND ULTRAVIOLET LASERS Annual Technical Report, 1 Oct. 1983 - 30 Sep. 1984
S. E. Harris and J. F. Young Dec. 1984 43 p
(Contract F49620-83-C-0016)
(AD-A151004; GL-3812; AFOSR-85-0134TR) Avail: NTIS HC A03/MF A01 CSCL 02/5

This program has supported theoretical and experimental studies in several areas of research on XUV physics and laser technology. The highlight of our work during the previous year has been the definition and experimental confirmation of a new class of levels which we term as quasi-metastable. These levels allow significant simplification in our store and transfer methods and, of more importance, will, in certain cases, allow lasering in the extreme ultraviolet without the need for a transfer laser. Our work on these levels is summarized in Appendices A and B of this report. Section 2 of this report summarizes the status of our other projects, Section 3 lists the publications which have resulted under this contract, and Section 4 lists personnel who are presently supported by this contract. GRA

N85-24297# Department of the Air Force, Washington, D.C.
ACTIVE DISPERSION CONTROL FOR A DOPPLER BROADENED LASER Patent Application
R. L. Facklam, inventor (to Air Force) Filed 11 Dec. 1984 14 p
(AD-D011570; US-Patent-Appl-SN-680432) Avail: NTIS HC A02/MF A01 CSCL 20/5

The present invention broadly relates to a laser clock and, more particularly, is concerned with a servo control system that improves the long-term stability of the clock by controlling errors due to optical dispersion effects caused by aging of the laser and change in its temperature. A method for controlling the output of a laser in a laser clock to compensate for changes in the output of the laser due to optical dispersion resulting from laser aging and changes in laser temperature is described, which comprises, comparing the output frequency of the laser clock with a standard of known frequency, such as an atomic clock. Calculating the change in laser discharge current corresponding to any difference between the laser clock frequency and the standard required to adjust the laser clock frequency to a predetermined frequency value, and adjusting the laser discharge current to a value corresponding to the predetermined laser clock frequency. GRA

N85-24298# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
LASER-INDUCED FLUORESCENCE OF METAL-ATOM IMPURITIES IN A NEUTRAL BEAM
C. F. Burrell, R. V. Pyle, Z. Sabetimani, and A. S. Schlachter Oct. 1984 9 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3-7 Dec. 1984
(Contract DE-AC03-76SF-00098)
(DE85-004980; LBL-18010; CONF-841218-15) Avail: NTIS HC A02/MF A01

The need to limit impurities in fusion devices to low levels is well known. By the technique of laser-induced fluorescence, the concentration of heavy-metal atoms in a neutral beam caused by their evaporation from the hot filaments in a conventional high-current multifilament hydrogen-ion source was investigated. DOE

N85-24299# Institut Franco-Allemand de Recherches, St. Louis (France).
LASERS IN THE DOMAINS OF ULTRASHORT-TIME PHENOMENA PHYSICS AND BALLISTICS [LASER IN DER KURZZEITPHYSIK UND BALLISTIK]
M. Hugenschmidt 19 Oct. 1983 47 p refs In GERMAN Presented at Conf., Oberpfaffenhofenn, West Germany, 7-10 Mar. 1983
(ISL-CO-236/83) Avail: NTIS HC A03/MF A01

The characteristic properties of laser radiation are explained. Laser applications using the high specific energy densities, the focusability of the radiation, and the possibility of energy transport over large distances are mentioned, e.g., in materials machining and laser weapons. The physical mechanisms of the interaction between radiation and matter are explained. Laser measurements (laser range finders, photographic methods, interferometry, holography, picoseconds measuring technique, laser scattering methods, and laser infrared measuring methods) are presented. The utilization of high energy and high power lasers is discussed. Author (ESA)

N85-24300# Institut Franco-Allemand de Recherches, St. Louis (France).
LASER WITH A HOLLOW COPPER CATHODE [KUPFERHOHLKATHODENLASER]
Th. Lasser and K. Schetter 28 Jun. 1983 21 p refs In GERMAN
(ISL-R-119/83) Avail: NTIS HC A02/MF A01

A hollow copper cathode laser (HCL) was developed. A theoretical model of hollow cathode discharges is presented. In the IR wavelength range 720 to 780 nm this laser has several lines which oscillate at low threshold currents. All tests in the UV domain are unsuccessful. Applications of HCL's in the UV and very far UV, and for the incoherent pumping of dye lasers are described. Author (ESA)

N85-24301# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
DEVELOPEMENT OF A THEORETICAL MODEL TO DESCRIBE THE INTERACTION BETWEEN ELECTRIC DISCHARGE AND SUPERSONIC FLOW OF A PULSED CO LASER Ph.D. Thesis
Holger Jacoby Dec. 1984 105 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-913)
(DFVLR-FB-84-45; ISSN-0171-1342) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 34

A theoretical model to describe the interaction phenomena of heat release in a supersonic flow was developed. It is based on a finite difference method. Reliability is proved by analytical and numerical tests. For the case of a pulsed electric discharge in a Mach 3 flow the formation and propagation of density perturbations are investigated and results are presented for different energy distributions within the discharge volume. The repetition frequency of pulsed lasers can be exactly determined by calculating the clear-time of the flow. The applicability of the model to the description of other laser types is shown. Author (ESA)

N85-24089# Joint Publications Research Service, Arlington, Va.
MULTILAYER REFLECTING SYSTEMS BASED ON GLASSY CHALCOGENIDES FOR INFRARED LASERS Abstract Only
Yu. Yu. Firtsak, N. I. Dovgoshey, V. F. Sharkov, T. N. Kurochkina, A. A. Tarnay, and I. I. Muchichka *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 59-60 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 48-52 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24095# Joint Publications Research Service, Arlington, Va.
LASER BEAM SHAPING SYSTEM WITH REDUCED OBJECTIVE DIAMETER Abstract Only
E. Ye. Skoblo, N. I. Kulikovskaya, I. O. Rybalko, and D. A. Ovchinnikova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 63-64 Transl. into ENGLISH

from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 62 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24096# Joint Publications Research Service, Arlington, Va.
SPHERICITY GAUGE FOR WAVEFRONT OF LASER RADIATION Abstract Only
V. P. Andronov, Ye. I. Dmitriyev, and A. P. Shestakov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 64 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 58-59 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24150# Joint Publications Research Service, Arlington, Va.
SPECIFICATIONS OF NEW INDUSTRIAL LASERS REVIEWED
V. G. Osipova *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-006) 27 Mar. 1985 p 20-26 Transl. into ENGLISH from Mekhan. i Avtomatiz. (Moscow), no. 6, Jun. 1984 p 25-27 (For primary document see N85-24146 14-31)
Avail: NTIS HC A04

N85-24485# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF POLARIZATION STRUCTURE OF REPEATED SCATTERING BACKGROUND IN OPTICAL LASER SOUNDING SIGNALS Abstract Only
G. M. Krekov and M. M. Krekova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 52-53 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 969-974 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-24302# Air Products and Chemicals, Inc., Allentown, Pa.
SOLID STATE COMPRESSOR Research and Development Status Report, 1 Sep. - 31 Dec. 1984
W. A. Steyert 25 Jan. 1985 41 p
(Contract N00014-83-C-0394)
(AD-A150790; SR-6) Avail: NTIS HC A03/MF A01 CSCL 13/7

Pennsylvania State University has continued their basic ceramic material studies but has been unable to fabricate complete high performance drivers. APCI continued testing and modifying the one cell simulator. Work was also done on fabricating elastomers and designing a one cell prototype compressor. CeramPhysics analyzed the drive characteristics of the three cell simulator and achieved a 2:1 compression ratio with the peristaltic compression mechanism. We believe that the single cell prototype compressor which is being designed will demonstrate the feasibility of building a closed cycle J-T compressor which incorporates the solid state compressor concepts. GRA

N85-24303# Eaton Corp., Southfield, Mich. Engineering and Research Center.
HYPERGOLIC COMBUSTION DEMONSTRATION IN A RECIPROCATING INTERNAL COMBUSTION ENGINE Final Report, Sep. 1981 - May 1984
D. H. Scharnweber May 1984 52 p
(Contract DAAE07-81-C-4121)
(AD-A150846; ERC-TR-84033; TACOM-TR-13042) Avail: NTIS HC A04/MF A01 CSCL 21/7

The theory of hypergolic combustion was experimentally verified in a reciprocating internal combustion engine by preheating the fuel to near 1000 F before direct high pressure injection into the combustion chamber. Dramatic reductions in ignition delay and exhaust smoke were observed. The potential for combustion rate control and a major improvement in engine power density were also demonstrated. Multifuel operation was addressed. GRA

N85-24304# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
THREE-DIMENSIONAL SENSING AND INTERPRETATION Interim Report
G. J. Agin, M. J. Uram, and P. T. Highnam Jan. 1985 53 p
(Contract F33615-83-C-1023; ARPA Order 3597)
(AD-A150890; CMU-RI-TR-85-1) Avail: NTIS HC A04/MF A01 CSCL 06/4

The main goal of this project is to produce a representational scheme that can be used to compare shape descriptions of solid three-dimensional objects. We are working toward a demonstration to show recognition and determination of position and orientation of solid objects on a tabletop, using a sensor consisting of a light-stripe projector and camera mounted in the hand of a robot manipulator. This report presents the results of a number of activities directed toward that goal: calibration and use of the range finder, a tactile sensor for exploring a three-dimensional domain, a system for identifying pipes in a bin, a method for assessing the similarity of cross-section curves, and pose cluster matching, a new technique for shape matching. Author (GRA)

N85-24305# Environmental Research Inst. of Michigan, Ann Arbor.
3D (THREE-DIMENSIONAL) SENSOR FOR ADAPTIVE SUSPENSION VEHICLE Final Report, Dec. 1982 - Dec. 1983
D. M. Zuk, M. L. DellEva, and P. W. VanAtta Nov. 1984 24 p
(Contract DAAE07-83-K-R008)
(AD-A150921; ERIM-164700-4-F) Avail: NTIS HC A02/MF A01 CSCL 06/4

This report describes the operation of an imaging optical radar system which measures the range to every point in its field of regard. The system is designed for use on the Adaptive Suspension Vehicle walking machine to provide local terrain 3D imagery for analysis to determine foot placement. The design specifications, system tests, measured performance and example imagery are presented. GRA

N85-24306# Bendix Corp., Kansas City, Mo.
ROBOTIC DEBURRING. PART 2: EVALUATION OF CUTTERS AND NONCOMPLIANT TOOLING
R. J. Lambrechts Jan. 1985 37 p refs
(Contract DE-AC04-76DP-00613)
(DE85-006182; BDX-613-3169-Pt-2) Avail: NTIS HC A03/MF A01

A pneumatic drill motor was rigidly attached to the tool flange of a six-axis robot for deburring studies. Attempts to deburr various details including straight edges, contours, and holes with this robot have produced inconsistent edge breaks on aluminum and stainless steel parts because of noncompliance. Much of the problem lies in the variation of feature location on the parts. properly oriented tooling compliance is essential for effective deburring and chamfering and should compensate for the detail variation in machined and cast parts. DOE

N85-24307# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
SEISMIC ANALYSIS OF ROTATING MECHANICAL SYSTEMS
A. H. Soni and V. Srinivasan Jun. 1984 252 p
(Grant NSF CEE-81-08119)
(PB85-149599; NSF/CEE-84042) Avail: NTIS HC A12/MF A01 CSCL 13I

Three mathematical models are developed to model a rotating mechanical system in the time domain; earthquake excitation is assumed to be a deterministic function of time. The rigid body model models the rotating system as a rigid body spinning in space, and includes factors such as gyroscopic effects, rotor bearing interaction effects, base rotation (including Coriolus effects), and base translation. The beam model incorporates the flexibility of the rotating system using Timoshenko beam theory, and includes factors such as rotatory inertia, shear deformation, intermediate disks and flywheels, and effects of initial stresses due to axial force and axial torque. The three-dimensional elasticity model ioncorporates the flexibility of the system using the three-dimensional theory of elasticity. Numerical examples are

presented for each of the models, and results of the examples are presented in graphic form. User's manuals and listings of computer programs based upon the models (GYROT for the rigid body model; ROBET for the beam model; and AXIST for the three-dimensional model) are included. GRA

N85-23773# Centre Technique des Industries Mecaniques, Senlis (France).
SOFTWARE FOR DESIGNING TEETH FOR REDUCTION GEARS AND TRANSMISSIONS [LOGICIEL DE CONCEPTION DES DENTURES D'ENGRENAGES POUR REDUCTEURS ET BOITES DE VITESSES]
L. Faure and A. Borrien *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p In FRENCH (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23775# Ruhr Univ., Bochum (West Germany).
LOAD CAPACITY OF CAGES OF ROLLER BEARINGS FOR PLANET WHEELS
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L. M. Orestova *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-004) 4 Mar. 1985 p 17-22 Transl.

into ENGLISH from Kuznechno-Shtempovochnoye Proizvod. (Moscow), no. 5, May 1984 p 39-46 (For primary document see N85-24152 14-31)
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N85-24170# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF GAS-TURBINE ENGINE BLOWER IMPELLER VIBRATIONS WITH CHANGE IN ENGINE INTAKE CONDITIONS Abstract Only
D. S. Yelenevskiy and V. V. Malygin *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 31-32 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 10, Oct. 1983 p 81-85 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24178# Joint Publications Research Service, Arlington, Va.
MODEL OF FRICTION BEARING HYDRODYNAMICS Abstract Only
S. B. Cherebatskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 42 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 73-77 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24180# Joint Publications Research Service, Arlington, Va.
COMPUTATIONS FOR SEGMENTED RADIAL BEARINGS Abstract Only
I. Ya. Tokar, I. V. Saychuk, and M. G. Vishnivetskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 46 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 11, Nov. 1983 p 9-11 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24182# Joint Publications Research Service, Arlington, Va.
WORK OF AXIAL BEARING UNDER DYNAMIC LOADING Abstract Only
Ye. I. Zaretskiy, L. P. Serezhkina, and I. D. Usachev *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1985 p 49 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 8, Aug. 1983 p 11-12, 14 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

N85-24191# Joint Publications Research Service, Arlington, Va.
PLANS, DEVELOPMENTS IN ROBOTICS
Kristof G. Kocsis *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 11-16 refs Transl. into ENGLISH from Magiap Hirlap (Budapest), 28 Feb. p 7 (For primary document see N85-24189 14-31)
Avail: NTIS HC A06/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-24308# Council for Scientific and Industrial Research, Pretoria (South Africa). Technical Services Dept.
MINI-SEMINAR ON NON-DESTRUCTIVE TESTING
Oct. 1983 148 p refs Seminar held in Pretoria, 21 Mar., 16 May, 13 Jun., 1 Aug., and 12 Sep. 1984 and in Johannesburg, 18 Apr., 4 Jul., and 17 Oct. 1984
(CSIR-TSD-0009/83; ISBN-0-7988-2604-5) Avail: NTIS HC A07/MF A01

Nondestructive testing and production engineering were discussed. Topics presented include: value engineering; materials handling, industrial training, automated component handling systems, technical communication, more productive inspection, finishing techniques, and plant maintenance. For individual titles, see N85-24309 through N85-24317.

N85-24309# ESCOM, Cleveland (South Africa).
STATUS OF THE U.K. N.D.T. INDUSTRY TODAY
E. A. Lloyd *In its* Mini-Seminar on Non-Destructive Testing Oct. 1983 8 p (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

Government interest in the advancement of nondestructive testing methods is discussed. The problem of manufacturing costs was investigated and it was found that these could most effectively be minimized by the provision of abundant, cheap and secure supplies of energy. Exploitation of North Sea oil reserves, the expansion of the Nuclear Power Program, and measures to increase the availability of existing power plant within the Electrical Industry, were all proposed as means of reducing dependence on expensive and increasingly unreliable imported energy. The reliability of pressurized equipment is seen as a principal problem area in nearly every activity associated with a secure energy supply. Representations and recommendations are made for the rationalization and expansion of the domestic NDT industry. E.A.K.

N85-24310# South African Bureau of Standards, Pretoria.
BASIC PRINCIPLES OF INDUSTRIAL RADIOGRAPHY
P. Bestbier *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1984 14 p (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

The history of the discovery of X-rays is recounted. In 1895, a German physicist, Wilhelm Conrad Rontgen, noticed that some barium platinocyanide crystals glowed brightly in the neighbourhood of a working cathode ray tube, even when the tube was covered up. He also noticed that photographic plates left in the vicinity of the tube became fogged. He concluded that some invisible radiation could penetrate substances opaque to ordinary light. Further experiments showed that, when using a fluorescent screen, he could see the bones in his hand. He also determined that these rays were not deflected by magnetic or electric fields. It was concluded that the rays could not consist of electrically charged particles and assumed that they were some kind of longitudinal wave motion. It is now known that X-rays have the same nature as light waves, but with a very much shorter wavelength. E.A.K.

N85-24311# Uniray Technical Services (Proprietary) Ltd., Pretoria (South Africa).
STANDING OF INDUSTRIAL RADIOGRAPHY IN SOUTH AFRICA
J. J. Marais *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 5 p (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

Industriall radiography in South Africa is examined and the application of radiographic testing and for what reasons is determined. The status of training for industrial radiographers is considered and radiographic techniques used in South Africa are compared. The question that needs answering is, whether radiography is used in South Africa because it is the best nondestructive testing (NDT) technique available for the specific applications or because of other reasons which do not contribute towards the overall aim of NDT, namely to ensure fitness for purpose of the parts or components which are tested. The NDT methods which are most widely used are: Radiographic Testing (RT), Ultrasonic Testing (UT), Penetrant Testing (PT), Magnetic Testing (MT). E.A.K.

N85-24312# Atomic Energy Board, Pretoria (South Africa).
RADIOLOGICAL SAFETY ASPECTS OF INDUSTRIAL RADIOGRAPHY
A. P. Hanekom *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 5 p refs (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

The hazards of industrial radiography are outlined. Industrial Radiography and especially gamma-radiography, a very powerful tool in nondestructive testing. Over the past decade the number of specialist firms who have been authorized to possess and use sealed radioactive sources for gamma-radiography, have increase in the number of sources. The use of these sources is not without significant risks. (1) Due to its wide spectrum of energies, hgih specific activity, physical size, availability and cost, Iridium-192 is at present the most popular radiography source. Very large doses of radiation to small portions of the body may cause so much damage that surgery will have to be undertaken. Three accidents are reported, where the persons sustained injuries which resulted in medical treatment. E.A.K.

N85-24313# Israel Inst. of Tech., Haifa. Equipment Research Unit.
ULTRASONIC NON-DESTRUCTIVE TESTING TECHNIQUE
S. Golan *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1984 27 p refs (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

The significance of the ultrasonic technqiue and the basic laws of ultrasonic flaw detection are presented. The limitations of the technique are outlined. The main areas of the present research and development are described. The source of the limitation of the technique is discussed. It is suggested that close communication between the researchers and users of the technique should be established in South Africa to improve the level of ultrasonic practice. The two main areas in which ultrasonic are applied in industry are: (1) flaw detection in castings, forgings, wrought materials and welds; and (2) thickness monitoring, corrosion detection and lamination detection where access is restricted. E.A.K.

N85-24314# Rohloff (H.) Proprietary Ltd., Pretoria (South Africa). Material Testing Dept.
PRACTICAL SURFACE METHODS
R. Pendrill *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 27 p (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

Two of the most common techniques for flaw detection on the surfaces of component parts are dye-penetrant and magnetic particle are discussed. Dye-penetrant inspectin is one of the basic nondestructive surface testing techniques. It is an easily applied surface inspection system that can be used on all metals and many nonmetallic substances. The basic components are: (1) penetrant dye of high coloration which is applied to the object to be examined; and a cleaning preparation to remove excess penetrant from the surface of the spepcimen; and (3) a chalk based white developer. The magnetic particle inspection is a subsurface nondestructive test. It is confined to ferromagnetic and paramagnetic materials. E.A.K.

N85-24315# Rohloff (H.) Proprietary Ltd., Pretoria (South Africa).
APPLICATIONS OF EDDY CURRENTS
B. G. Rohloff *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 4 p (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

The application of eddy currents which is a high speed

contactless, efficient nondestructive testing method is discussed. Eddy Currents are grouped with electromagnetic methods, under the cloak of electrical methods, other than UT, RT and MPI. The allied Eddy Current and Stray Flux methods are considered. Electric nondestructive testing is influenced by such parameters as permeability, conductivity, sensor design and frequency. E.A.K.

N85-24316# South African X-Ray (Proprietary) Ltd., Pretoria.
FLASH RADIOGRAPHY
S. F. Botten *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 9 p refs (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

Flash Radiography is a radiography technique is discussed. The difference between flash radiography and conventional radiography is outlined. In conventional Radiography the component, or subassembly, being radiographed is static while in flash radiography the object being radiographed is not static. Conventional X-Radiography uses a lower energy over a longer exposure, whereas flash X-ray has to pack a very high energy into a single pulse of the order of a few tens of nanoseconds. E.A.K.

N85-24317# South African X-Ray (Proprietary) Ltd., Pretoria.
NEW DEVELOPMENTS IN INDUSTRIAL RADIOGRAPHY
W. J. Daker *In* CSIR Mini-Seminar on Non-Destructive Testing Oct. 1983 18 p refs (For primary document see N85-24308 14-38)
Avail: NTIS HC A07/MF A01

Radiography is historically one of the major techniques available for nondestructive testing. It is able to detect, at any rate in principle, the internal condition of the test object. It has the advantage of presenting its results in the form of a visual image of the test object. A disadvantage is that, as an essentially photographic method, it required time to make the exposure and process the film before the image becomes visible. Limiting object thickness has also prevented the production of high quality images. The utilization of the latest developments in industrial radiography is examined. E.A.K.

N85-24318# Oklahoma State Univ., Stillwater. Office of Business and Economic Research.
SOME RECENT DEVELOPMENTS IN SYSTEMS RELIABILITY Final Report, 1 Jul. 1983 - 30 Sep. 1984
M. O. Locks Jan. 1985 45 p
(Grant AF-AFOSR-0251-82)
(AD-A150661; OSU-OBER-85-1; AFOSR-85-0094TR) Avail: NTIS HC A03/MF A01 CSCL 05/1

System reliability analysis calculates the probability of success for a system, based on the component reliabilities and the configuration. First, a logic function is obtained in the form of either a tree, chart, graph, diagram or list of paths. From this logic function a probability formula is derived. The classical or conventional method of generating a formula is inclusion-exclusion (IE). In the past decade there have been some significant new developments that resulted in ways to estimate the system reliability that are more efficient than IE. Two of these techniques are discussed in this paper; sum of disjoint products (SDP), and the topological reliability (TR) of Satyanarayana and Prabhaker (S&P). This paper covers the theory and procedures of both techniques, shows their interrelationships with IE, and discusses complexity considerations and computer time needed for preparation of a system formula. The discussion on TR also includes advanced applications such as overall reliability and k-terminal reliability, classes of problems that can conveniently be solved by TR with minor modification of the logic. Author (GRA)

N85-24319# Lockheed-Georgia Co., Marietta.
ADVANCED LIFE ANALYSIS METHODS. VOLUME 3: EXPERIMENTAL EVALUATION OF CRACK GROWTH ANALYSIS METHODS FOR ATTACHMENT LUGS Final Report, 3 Sep. 1980 - 30 Sep. 1984
K. Kathiresan and T. R. Brussat 17 Sep. 1984 384 p
(Contract F33615-80-C-3211)
(AD-A151058; LG82ER0117-3; AFWAL-TR-84-3080-Vol-3) Avail: NTIS HC A17/MF A01 CSCL 20/11

This volume covers the results of experimental evaluation of crack growth analysis methods for attachment lugs which were reported in Vol. 2 of the final report. These experiments were conducted to assess the damage tolerance of aircraft attachment lugs. The experimental test program included baseline material characterization, crack initiation, residual strength and crack propagation tests. Several loading and geometric complexities were considered in the test program. The types of loading complexities included were constant-amplitude, block spectrum and flight-by-flight spectrum, symmetric and off-axis loadings. Peak stress levels in the lug which were below and above the yield strength of the materials were also included in the test program. The types of geometric complexities considered were straight, tapered, dogbone, clevis and real aircraft lug configurations. Additional geometric complexities considered include lugs with lower thickness and lugs with interference-fit bushings. The experimental results were correlated with the analytical predictions made using methods described in Vol. 2 of the final report and are presented in this volume. Excellent correlation results were obtained for most of the test cases. In some cases, the developed analytical methods needed some improvements or some new solutions had to be generated. Such efforts were conducted and the refined correlation results are also included in the present volume. GRA

N85-23792# Westland Helicopters Ltd., Yeovil (England). D.C. M.D. Transmissions.
THE OBSERVATION AND INTERPRETATION OF GEAR TOOTH FAILURES
B. A. Shotter *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 13 p (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-24064# Joint Publications Research Service, Arlington, Va.
MODAL SYNTHESIS OF MULTIDIMENSIONAL PI-REGULATORS FOR OBJECTS WITH INERTIAL SECTIONS Abstract Only
A. A. Voyevoda and S. A. Stavropoltsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 33-34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Priborostr. (Leningrad), v. 26, no. 8, Aug. 1983 p 42-46 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24771 Centre National d'Etudes Spatiales, Toulouse (France).
INTRODUCTION TO METHODS OF EVALUATING THE OPERATIONAL RELIABILITY OF COMPLEX SYSTEMS: APPLICATION TO SATELLITE CONTROL GROUND SUPPORT [UNE INTRODUCTION AUX METHODES D'EVALUATION DE LA SURETE DE FONCTIONNEMENT DES SYSTEMES COMPLEXES: APPLICATION AUX SEGMENTS SOL DE CONTROLE DES SATELLITES]
P. A. Ricard *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 641-669 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-24320*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECENT DEVELOPMENTS IN THE DYNAMICS OF ADVANCED ROTOR SYSTEMS
Wayne Johnson Mar. 1985 117 p refs
(NASA-TM-86669; A-85089; NAS 1.15:86669) Avail: NTIS HC A06/MF A01 CSCL 20K

The problems that were encountered in the dynamics of advanced rotor systems are described. The methods for analyzing these problems are discussed, as are past solutions of the problems. To begin, the basic dynamic problems of rotors are discussed: aeroelastic stability, rotor and airframe loads, and aircraft vibration. Next, advanced topics that are the subject of current research are described: vibration control, dynamic upflow, finite element analyses, and composite materials. Finally, the dynamics of various rotorcraft configurations are considered: hingeless rotors, bearingless rotors, rotors with circulation control, coupled rotor/engine dynamics, articulated rotors, and tilting proprotor aircraft. Author

N85-24321# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
FATIGUE CRACK TOPOGRAPHY
Loughton, England Nov. 1984 238 p refs Conf. held in Sienna, Italy, 1-6 Apr. 1984
(AGARD-CP-376; ISBN-92-835-1480-7) Avail: NTIS HC A11/MF a01

Available methods for determining the growth rate of cracks from their topography are reviewed and any shortcomings in these methods are noted. Further research and development is recommended. Phenomenological aspects of fatigue fractures; methods and means of crack front marking and fracture surface analysis techniques are emphasized. For individual titles, see N85-24322 through N85-24336.

N85-24322# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ESSENTIAL FEATURES IN FATIGUE FRACTURES AND REMARKABLE PHENOMENA IN FATIGUE CRACK GROWTH
H. Klingele (Institute for Scanning Electron Microscopy, Munich, West Germany) *In its* Fatigue Crack Topography Nov. 1984 28 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

Fatigue fracture is defined as the separation of material in small steps with the least possible consumption of energy. Every solid material that shows even the smallest amount of remaining deformation before breaking can be separated by fatigue fracture including the mineral layers of Earth. Fatigue fracture always begins in the point of minimum strength, and avoids regions of high strength as well as obstacles. Fatigue fracture characteristics and origin are discussed. How to select the measuring line and the proper areas for quantitative evaluation is examined. Estimating invisible striations and finding the order of magnitude in destroyed fatigue fracture surfaces are explained. Examples of fatigue fractures in Earth's crust are cited. A.R.H.

N85-24323# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
FATIGUE FRACTURE TOPOGRAPHY
P. J. E. Forsyth *In* AGARD Fatigue Crack Topography Nov. 1984 13 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The texture of a fatigue fracture can vary between the extremes of a bright reflective surface (with facets that may approach planarity) to a rough highly irregular surface. Roughness is imparted by microstructural heterogeneity in its various forms and represents tortuous fragmented crack paths. The degree of roughness generally increases with increasing stress and degree of triaxiality. The crack tip plastic zone is bound to increase with stress and inasmuch as the larger zone will encompass more off plane particles that initiate further microcracks, so the fracture becomes rougher. On a finer scale of the fatigue striations, whether they relate to individual loads or to flight loads, i.e., (a ground air ground cycle), crack front deviation or tilting from and to the general fracture plane occurs in a periodic manner. This can be demonstrated for both metals and polymers and frequently this deviation is considerably greater than the crack tip opening displacement. Abrupt changes in fracture reflectivity or abrupt changes in crack front tilt make very effective crack position markers, and the loading conditions to produce these can be optimized. Author

N85-24324# National Aerospace Lab., Emmeloord (Netherlands).
FATIGUE CRACK PROPAGATION AND FRACTURE IN 7050 AND 7091 ALUMINUM ALLOY FORGINGS
R. J. H. Wanhill, H. J. Kolkman, and L. Schra *In* AGARD Fatigue Crack Topography Nov. 1984 14 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The fatigue crack propagation and fracture behavior of 7050-T736 and 7091-T7E69 aluminum alloy die forgings was investigated. Under spectrum loading, the fatigue crack propagation resistance of 7091-T7E69 was greatly inferior owing to early commencement of tensile crack jumping, which also occurred under constant amplitude loading with R=0.5. Early crack jumping could be explained by application of Thomason's theory of tensile fracture. Fractographic and microstructural analysis provided support to this explanation and indicated that the oxides due to air atomization of the powder have a profound effect on the fatigue and fracture properties of 7091-T7E69. It is concluded that the poor fatigue crack propagation behavior of 7091-T7E69, which is a major limitation to its use in engineering structures, might be remedied by preparing the powder in inert environments. However, this may lead to unacceptable losses in strength. Author

N85-24325# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
TWO RECENT CASES OF MARKER LOAD APPLICATIONS ON CARGO/FIGHTER AIRCRAFT FATIGUE TESTS
David R. Erskine and John L. Hopkins *In* AGARD Fatigue Crack Topography Nov. 1984 20 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF]en1] A01

Two applications of marker cycles under distinctly different loading spectra are discussed. The first spectrum represents a cargo aircraft load environment, with a maximum load case of 60% limit. The other spectrum represents a fighter usage with the usually high frequency of near limit load cycles. Examples are presented of the crack growth, the marking and the engineering approaches. The effects of the marker cycles on the natural growth are shown to be insignificant. Good fractographic correlation was found in both component and full scale tests. E.A.K.

N85-24326# Centre d'Essais Aeronautique Toulouse (France).
EFFECT OF FLIGHT SEQUENCES IN COMPLEX LOAD HISTORIES ON CRACK FRONT MARKING
A. Liberge and C. Bleuzen *In* AGARD Fatigue Crack Topography Nov. 1984 25 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

Some modifications of FALSTAFF were studied to promote the use of this loading spectrum in the case of structural large specimens testing, for which it is critical to assess a good fractrographic traceability of the crack surface. Some modifications of FALSTAFF were studied for four spectra: (1) omission of the smallest load ranges of FALSTAFF; (2) gathering of severes flights of spectrum; (3) FALSTAFF with an overload to 8, lg; and (4) FALSTAFF with an overload to 8, 5g. Aluminum alloys were tested for fatigue on open hole specimens, joint specimens - no load transfer specimens - single shear specimen, high load transfer and secondary bending, and crack growth test on ASTM CT specimens. Spectrum (1) gives approximately the same fatigue tests results as FALSTAFF but its crack surface is not readable in fractography. Spectra (2), (3) and (4) look traceable in the range of crack rates from 3.10/5 to 10/2 mm per flight, but they have increased fatigue lifes comparatively to FALSTAFF. E.A.K.

N85-24327# Messerschmitt-Boelkow-Blohm/Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
GENERATION OF MARKER LINES BY MEANS OF MARKER LOADS
K. Hoffer and R. Hillbrecht *In* AGARD Fatigue Crack Topography Nov. 1984 7 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

Investigation fatigue damages revealed that it is extremely difficult to pursue the crack formation whenever the tests simulate flight by flight loads. Various methods to generate marker lines were proposed. Fatigue tests (FALSTAFF flight by flight loads) were performed, i.e., const.-amplitude tests interspersed in their crack propagation phase at regular intervals. The number of simulated flight by flight cycles is reduced. These procedures aim at achieving damage equivalence. The following requirements have to be met: (1) the crack propagation rates produced by interspersed constant amplitude loads must be equal to the rates that would have been produced by the load sequences not simulated in the flight by flight program; (2) the marker lines caused by the interspersed constant amplitude loads must be visible on the fatigue fracture surface. E.A.K.

N85-24328# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
GENERATION OF MARKER LINES ON FATIGUE FRACTURE SURFACES
Manfred Kalweit *In* AGARD Fatigue Crack Topography Nov. 1984 5 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

A flight by flight loading program for a predominantly maneuver loaded military aircraft structure it was proposed, with respect to the generation of marker lines, to alter the more or less arbitrary arrangement of the loading sequence which is representative for normal service operation. The 45 most severe load cycles in each particle sequence comprising of 250 flights were interspersed into the first 45 flights of each of the partial sequences. Fatigue tests with simple test specimens were run to investigate if, with the proposed loading arrangement, easily visible, clearly identifiable marker lines could be operated. It was investigated if the concentration of the high load cycles in the first flights of a partial load sequence would create any misleading test results with respect to crack propagation and fatigue life. Flight by flight fatigue tests with a total of nine notched AL specimens, loaded uniaxially in tension and compression, were performed. From these nine specimens, five were used to generate marker lines and the remaining four were used to determine fatigue life. The tests were conducted with two loading programs which differed only in the selected sequence of load cycles. E.A.K.

N85-24329# Lockheed-California Co., Burbank.
PERIODIC LOADING SEQUENCES FOR THE SYSTEMATIC MARKING OF FATIGUE CRACK FRACTURE SURFACES
J. C. Ekvall, L. Bakow, and T. R. Brussat *In* AGARD Fatigue Crack Topography Nov. 1984 9 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

Periodic loading sequences which leave characteristic markings on the fracture surface are used for evaluating the results of crack growth tests. These markings aid in the evaluation of crack growth rates and prediction formulations, and define the shape of cracks at specific times during the test. To illustrate how loading sequences are used to produce regularly spaced fracture surface markings in crack growth tests, three examples are presented. These include a fighter spectrum, a transport spectrum, and constant amplitude loading sequences. The composition of each of the loading sequences is discussed, and photographs of some of their resultant fracture surfaces are shown. The fracture surface markings produced by the three loading sequences are visible to the naked eye and photographed without magnification. Author

N85-24330# National Aerospace Lab., Amsterdam (Netherlands).
MODIFICATIONS OF FLIGHT BY FLIGHT LOAD SEQUENCES TO PROVIDE FOR GOOD FRACTURE SURFACE READABILITY
H. H. vanderLinden *In* AGARD Fatigue Crack Topography Nov. 1984 22 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

In order to establish an inspection schedule for fatigue, critical fastener holes in the wing lower skin of a fighter aircraft, crack growth data under realistic loading was required. Experimental determination of these data was a logical choice since a representative specimen was available. However, the spectrum and load sequence, representative for the Dutch usage of the aircraft, do not mark the fracture surface well enough. Methods to identify markers were evaluated: scanning electron microscopy gives the best results. Goals, means of accomplishment and detailed results are described of a pilot program in which modifications of the load sequences were investigated. Simple center notched and complex representative specimens were used. A marker version of the original sequence was validated. Author

N85-24331*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE USE OF MARKER LOADS AND REPLICAS FOR MEASURING GROWTH RATES FOR SMALL CRACKS
M. H. Swain and J. C. Newman, Jr. *In* AGARD Fatigue Crack Topography Nov. 1984 17 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The initiation and growth of small cracks (5-500 microns m) from edge notches in 2024-T3 aluminum alloy sheets were studied under constant amplitude loading. Two methods were used to measure crack shape and size. In the first method, striation marker bands were periodically formed along the crack front by interrupting the constant amplitude loading by either an elevated R-ratio load sequence, or by an overload sequence. In the second method, the surface crack length was monitored by taking surface replicas at regular intervals. The marker band techniques did not provide reliable crack length and crack shape information for cracks smaller than 2 mm. The replica technique provided accurate information for surface crack length at all crack lengths, and fracture tests on specimens with small cracks provided crack-shape information. Crack growth rates were plotted against the stress intensity factor ranges. The results exhibited the small crack effect, in that the small cracks grew faster than large cracks at the same stress-intensity factor range. A crack closure model was also used to analyze the growth of small cracks from small (inclusion) defects at the notch surface. Author

N85-24332# Aeronautical Research Inst. of Sweden, Bromma.
ON THE USE OF MARKER LOADS FOR FATIGUE CRACK GROWTH MEASUREMENTS
B. Palmberg *In* AGARD Fatigue Crack Topography Nov. 1984 12 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The possibility of using blocks of constant amplitude loading to produce macroscopic marks in the fracture surfaces is investigated. The parameters to be selected are the maximum marker load, the marker load ratio, the number of marker load cycles and the periodic interval between marker blocks. An optical stereo microscope is used to detect marker bands in the fracture surface. The parameters are chosen in order to obtain marker bands which appear as striation free when observed through a scanning electron microscope. Marker loads were added to both constant amplitude and spectrum loading during testing of two aluminum alloys. It was found that detectable marker bands can be produced and that the interaction effects seems to be small except when TWIST loading spectrum is used. Author

N85-24333# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FATIGUE CRACK TOPOGRAPHY AND CRACK GROWTH ANALYSIS
J. M. Potter, W. R. Garver (General Dynamics, Fort Worth, Tex.), K. M. Koepel (General Dynamics, Fort Worth, Tex.), and B. G. W. Yee (General Dynamics, Fort Worth, Tex.) *In* AGARD Fatigue Crack Topography Nov. 1984 6 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

Stepped blocks, repeating tensile loads, and minimal compression loading are features of flight-by-flight load histories shown to be effective in providing distinguishable marks on crack surfaces during spectrum-fatigue loading. A reflected-light optical microscope

equipped with stage micrometers can be used to trace crack growth histories in a variety of materials. This method of data collection is low cost, enabling economical investigation of random variations in crack growth behavior and statistical characterization. The distribution of time for a crack population to reach a given size in wrought aluminum is found to be adequately modeled by the Weibull distribution. Crack growth rates are found to be log-normal. A method is presented to determine crack growth rate populations when fracture surface markings are fragmentary, as in aluminum castings. Author

N85-24334# National Research Council of Canada, Ottawa (Ontario).
APPLICATION OF OPTICAL AND ELECTRON MICROSCOPIC TECHNIQUES IN THE FRACTOGRAPHIC DETERMINATION OF FATIGUE CRACK GROWTH RATES c37
R. V. Dainty *In* AGARD Fatigue Crack Topography Nov. 1984 26 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The fractographic derivation of fatigue crack growth information is entirely dependent on the fractographer's ability to correlate accurately the striated fracture surface topography with the applied test or service loads. Some techniques developed to acquire this type of quantitative information through the application of optical and electron microscopy are reviewed. Fractographic analyses of fatigue specimens and components that failed during laboratory and full-scale aircraft fatigue tests are presented. These analyses show how the identification and correlation of various fatigue load application formats, i.e., constant amplitude, programmed block, flight-by-flight and random loading, can be utilized to derive this type of experimental crack growth data. Author

N85-24335# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
NEW ANALYSIS ASPECTS OF THE FATIGUE CRACK PROPAGATION BEHAVIOR BY SEM IN SITU MICROSCOPY
K. Schulte, K. H. Trautmann, and H. Nowack *In* AGARD Fatigue Crack Topography Nov. 1984 10 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

In situ analyses of fatigue crack propagation in a SEM enable a more detailed observation of the fatigue process. This is of special value for variable amplitude loading conditions, where pronounced crack accelerating and decelerating effects occur. Results of the in situ observation are shown and are compared to the fracture surface morphology in the interior of the specimen and in the vicinity of the specimen surface. Author

N85-24336# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
CRACK PROPAGATION UNDER CONSTANT AND VARIABLE STRESS AMPLITUDES: A COMPARISON OF CALCULATIONS BASED ON THE STRIATION SPACING AND TESTS
Joachim Foth and Walter Schuetz *In* AGARD Fatigue Crack Topography Nov. 1984 9 p refs (For primary document see N85-24321 14-39)
Avail: NTIS HC A11/MF A01

The striation spacing was determined from fractographic examinations and compared to the crack growth rates in experiments both for constant amplitude and variable amplitude loadings for 6 different typical commercial aircraft alloys (Ti6Al4V, 7075-T7351, 2024-T3, AZ 74.61, HP 9-4-30, INCONEL 718). The following conclusions can be drawn: (1) under constant amplitude loadings striations are observed only in a limited region of crack growth rate and stress intensity range, respectively, depending upon the material; (2) for constant amplitude loading the striation spacing follows a straight line when plotted vs. crack growth rate (log-log plot) for all materials under consideration; (3) the crack growth behaviour is inhomogeneous over the entire fracture surface for a given crack length leading to considerable scatter of the striation spacing, which has to be taken into account when assessing the crack growth rate from striation spacing measurements; (4) for a tactical aircraft flight-by-flight loading sequence a correspondence of striation patterns on the fracture surface and typical sections of the loading sequence could not be achieved; and (5) an assessment of the stresses having acted from fractographic striation spacing measurements leads to good to fair results for constant amplitude but not for variable amplitude loading. A.R.H.

N85-24337*# National Aeronautics and Space Administration, Washington, D. C.
STATION KEEPING OF GEOSTATIONARY SATELLITES BY ELECTRIC PROPULSION
M. C. Eckstein Apr. 1985 43 p refs Transl. into ENGLISH of Conf. Paper from Deut. Ges. fuer Luft- und Raumfahrt, Cologne, DGLR Paper 80-009 43 p Presented at the Walter-Hohmann Symp. uber Raumflugmech., Cologne, 12-13 Mar. 1980 Original language doc. was announced in IAA as A80-41973 Transl. by Scientific Translation Services, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77820; NAS 1.15:77820; DGLR-Paper-80-009) Avail: NTIS HC A03/MF A01 CSCL 20K

As various types of perturbations tend to drive a geostationary satellite away from its prescribed position, occasional orbit corrections have to be carried out by means of a suitable propulsion system. In future geostationary missions, low thrust electric propulsion is likely to be applied for station keeping because of considerable mass savings. In this paper a station keeping strategy for electric propulsion systems is developed. Both the unconstrained case and the case where thrust operation constraints are present are considered and tested by computer simulation of a realistic example. Author

N85-24338*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNIFIED CONSTITUTIVE MATERIAL MODELS FOR NONLINEAR FINITE-ELEMENT STRUCTURAL ANALYSIS
A. Kaufman, J. H. Laflen (General Electric Co., Cincinnati), and U. S. Lindholm (Southwest Research Inst., San Antonio) 10 Jul. 1985 16 p refs Proposed for presentation at 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-86985; E-2529; NAS 1.15:86985) Avail: NTIS HC A02/MF A01 CSCL 20K

Unified constitutive material models were developed for structural analyses of aircraft gas turbine engine components with particular application to isotropic materials used for high-pressure stage turbine blades and vanes. Forms or combinations of models independently proposed by Bodner and Walker were considered. These theories combine time-dependent and time-independent aspects of inelasticity into a continuous spectrum of behavior. This is in sharp contrast to previous classical approaches that partition inelastic strain into uncoupled plastic and creep components. Predicted stress-strain responses from these models were evaluated against monotonic and cyclic test results for uniaxial specimens of two cast nickel-base alloys, B1900+Hf and Rene' 80. Previously obtained tension-torsion test results for Hastelloy X alloy were used to evaluate multiaxial stress-strain cycle predictions. The unified models, as well as appropriate algorithms for integrating the constitutive equations, were implemented in finite-element computer codes. Author

N85-24339*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CYCLIC STRUCTURAL ANALYSES OF ANISOTROPIC TURBINE BLADES FOR REUSABLE SPACE PROPULSION SYSTEMS
Jane M. Manderscheid and Albert Kaufman 12 Apr. 1985 13 p refs Presented at 1985 JANNAF Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985; sponsored by JANNAF
(NASA-TM-86990; E-2534; NAS 1.15:86990) Avail: NTIS HC A02/MF A01 CSCL 20K

Turbine blades for reusable space propulsion systems are subject to severe thermomechanical loading cycles that result in large inelastic strains and very short lives. These components require the use of anisotropic high-temperature alloys to meet the

safety and durability requirements of such systems. To assess the effects on blade life of material anisotropy, cyclic structural analyses are being performed for the first stage high-pressure fuel turbopump blade of the space shuttle main engine. The blade alloy is directionally solidified MAR-M 246 alloy. The analyses are based on a typical test stand engine cycle. Stress-strain histories at the airfoil critical location are computed using the MARC nonlinear finite-element computer code. The MARC solutions are compared to cyclic response predictions from a simplified structural analysis procedure developed at the NASA Lewis Research Center. Author

N85-24340# Virginia Polytechnic Inst., Blacksburg.
REDUCTION OF FREE-EDGE STRESS CONCENTRATION Interim Report
P. R. Heyliger and J. N. Reddy Jan. 1985 39 p
(Contract N00014-84-K-0552)
(AD-A150732; CCMS-85-01; VPI-E-85-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

The paper describes a quasi-three dimensional formulation and associated finite element model for the stress analysis of a symmetric laminate with free-edge reinforcement. Numerical results are presented to show the effect of the reinforcement on the reduction of free-edge stresses. It is observed that the interlaminar normal stresses are reduced considerably more than the interlaminar shear stresses due to the free-edge reinforcement. A proposed method of reducing the intensity of these large stresses is to reinforce the stiffness at the free edge by wrapping a lamina or collection of laminae around the free edge, forming a cap. The cap is intended to reduce the large displacement gradients near the free edge, thereby decreasing the interlaminar stresses and reducing the probability of delamination. Experimental studies indicate that a reinforcing cap is a viable method of maintaining laminate strength 15. The purpose of this study is to determine the effect of a reinforcing cap on the stress distribution in a symmetric composite laminate under uniform axial extension. Parametric studies are performed by varying the thickness, length, and lamination scheme of the cap. Numerical results are presented for several representative test cases. GRA

N85-24341# Texas Univ., Austin. Geotechnical Engineering Center.
WAVE PROPAGATION IN HETEROGENEOUS MEDIA Annual Report, 1 Feb. 1983 - 15 Feb. 1984
C. Suddhiprakarn Jun. 1984 197 p
(Grant AF-AFOSR-0062-83)
(AD-A150800; AFOSR-85-0099TR) Avail: NTIS HC A09/MF A01 CSCL 20/14

The propagation of stress wave due to a point type excitation in the form of a sinusoidal pulse in an infinite medium with inclusions with different properties was studied. The solution is carried out using the boundary element method in the frequency domain with a discrete fourier transform. The inclusion-medium interfaces are discretized using a constant element which assumes a uniform stress and displacement field over the element. Studies were conducted primarily with a two-dimensional plane strain model but some were also performed in the three-dimensional case, focusing on the attenuation characteristics and the velocity of the wave in terms of the arrival time for both the free field and the case with inclusions. Results are presented in the form of a dimensionless displacement and arrival times at the target under consideration. With a point excitation, as used in this study, the free field attenuation follows the geometrical damping law for both the two and the three-dimensional cases, except at distances in the neighborhood of one wavelength or closer, where a more complex pattern of waves is developed. GRA

N85-24342# Utah Univ., Salt Lake City. Coll. of Engineering.
ON THE CORNER SINGULARITY OF A 3-D GRIFFITH CRACK Final Report, 15 Sep. 1982 - 14 Mar. 1984
E. S. Folias and J. J. Wang Mar. 1984 34 p
(Grant AF-AFOSR-0324-82)
(AD-A150989; UTEC-84-027; AFOSR-85-0136TR) Avail: NTIS HC A03/MF A01 CSCL 20/11

This report discusses some further developments of an analytical solution to the 3-D Griffith crack problem. The analysis shows the stresses at the corner points to be singular of the order (1/2 + 2 nu). Moreover, the stress boundary conditions at the plate faces are shown to be proportional to (h-z), at the upper face, and to (h+z), at the lower face. GRA

N85-24343# Department of the Air Force, Washington, D.C.
VIBRATION ISOLATOR ACTUATOR Patent Application
R. L. Plante, inventor (to Air Force) Filed 10 Jan. 1985 14 p
(AD-D011574; US-Patent-Appl-SN-690438) Avail: NTIS HC A02/MF A01 CSCL 13/9

A novel actuator for controlling the position of a mirror segment of a segmented mirror assembly and for isolating the segment from vibration is described, which comprises, a moveable control member operatively interconnecting the segment and support structure for the mirror assembly; an actuator assembly, which may comprise an electrically controlled magnet and coil, operatively attached to the control member and responsive to an input signal, for moving the control member to selectively position the mirror segment relative to the support structure: a force amplifier connected to one or both ends of the control member for amplifying the force exerted on the control member, and which may be in the form of a pair of cooperating fluid filled bellows of different sizes coaxially disposed at one or both ends of the control member so that compression of the smaller bellows communicating with the larger bellows results in an amplification of the force imposed on the control member; a position sensor for sensing the position of the control member and providing a corresponding output signal; and programmable electronics for processing the output signal of the position sensor and providing the input signal to the actuator according to a preprogrammed scheme. GRA

N85-24344# Los Alamos Scientific Lab., N. Mex.
INVESTIGATION OF THE TIME HISTORY AND MODAL RESPONSES OF SOME SIMPLE LINEAR AND NONLINEAR SYSTEMS
Norman F. Hunter, Jr. 1985 10 p refs Presented at the 3rd Intern. Modal and Analysis Conf., Orlando, Fla., 28-31 Jan. 1985
(Contract W-7405-eng-36)
(DE85-002027; LA-UR-84-2911; CONF-850118-2) Avail: NTIS HC A02/MF A01

The results obtained from the numerical analysis of some simple (1 to 4 degree of freedom) linear and nonlinear systems are described. The systems are excited by force or acceleration impulsive loading and the acceleration responses are observed in both the time and frequency domains. The types of nonlinearities include gaps or dead zones, bilinear springs, and hysteretic springs or sliding joints. Characteristic results for these systems indicate that proceeding with a circle fit type model analysis based on the assumption that the system linear will indeed allow fitting of a modal circle to what appear to be modes in the system response. These pseudomodes will, however, be of little use in predicting overall system responses to other than the excitation used in the modal measurement. Typical response patterns of the nonlinear systems studied are summarized. DOE

N85-24345# Institut Franco-Allemand de Recherches, St. Louis (France).
STRESS IN AXIALLY SYMMETRICAL HEAVY METAL PROJECTILES DURING DISCHARGE [BEANSPRUCHUNG VON ROTATIONSSYMETRISCHEN SCHWERMETALLPROJEKTILEN BEIM ABSCHUSS]
R. Hunkler and G. Paulus 27 May 1983 20 p refs In GERMAN Presented at 7th Intern. Symp. on Ballistics, The Hague, 19-21 Apr. 1983
(ISL-CO-219/83) Avail: NTIS HC A02/MF A01

A numerical code was applied to simulate projectile deformation during discharge. The projectile consists of a tungsten cylinder stabilized during flight by a soldered steel plate. The acceleration process is simulated with the finite element model program for the elastoplastic simulation of impact phenomena. The interior

ballistics calculation model calculates the time evolution of the pressure at the projectile base. This pressure is introduced in the calculation as external load of the finite element structure of the projectile. The program gives entire momentum impulses of the acceleration phenomenon as well as all distortion and stress state of the finite elements as a function of time. The comparative values of the plastic strain and stress are calculated in order to estimate material stress. The simulation results show good agreement with experimental values. The dynamic loading of the projectile materials is represented by three-dimensional plots of the variation of velocity and comparative stress. Author (ESA)

N85-24346# Pittsburgh Univ., Pa. Dept. of Civil Engineering.
ELASTIC-PLASTIC ANALYSIS FOR CYCLIC LOADING USING A LINEARIZED YIELD CONDITION
M. A. M. Torkamani Sep. 1984 84 p refs
(Grant NSF CEE-82-06909)
(PB85-149607; SETEC-CE-85-003; NSF/CEE-84037) Avail: NTIS HC A05/MF A01 CSCL 20K

A formulation based on the incremental theory of plasticity with assumption of small displacements is presented for the plane stress problem under cyclic loading. This formulation uses kinematic hardening, associated flow rule, and a three parameter uniaxial symmetric, linearized yield surface. Elastic plastic matrices for the slides and corners of the yield focus are developed, and are used in the elastic plastic element, analysis. Through four sample cases, the procedure's ability to trace the elastic plastic behavior of material under cyclic loading is demonstrated. Strains, stresses, and displacements in the steps of the analysis are calculated. It is shown that hardening parameter H has an important effect on the amount of deflection of the beam. Cyclic loading is shown to result in stress concentration, large, deflection, and collapse. GRA

N85-24347# Clemson Univ., S.C. Dept. of Civil Engineering.
FINITE ELEMENT MODEL FOR CREEP IN COMPOSITE MASONRY Interim Report
S. C. Anand, B. Dandawate, and R. H. Brown Oct. 1984 72 p refs
(Grant NSF CEE-80-26767)
(PB85-150324; R-20S-84; NSF/CEE-84040; IR-5) Avail: NTIS HC A04/MF A01 CSCL 13M

A two-dimensional finite element model, developed to compute strains and stresses in composite masonary walls subjected to inplane external loads under linear elastic conditions, is extended: the influence of stress redistribution due to creep is included in the prediction of long-term creep strains. Two types of walls, a single by the wall and a composite wall, are analyzed under various loading conditions to examine the effect of stress changes on the walls' creep behavior. A numerical technique for calculating creep strains and incorporating the effect of changes in stress is presented, and shown to lead to stable solutions. This technique accounts for the effect of stress changes on creep in masonry analyses. An investigation of the initiation of crack and eventual failure of the collar joint due to creep, shrinkage, and temperature strains is recommended. GRA

N85-23787# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ROOT STRESSES IN CONFORMAL GEARS-STRAIN GAUGE AND PHOTOELASTIC INVESTIGATIONS
D. G. Astridge, B. R. Reason, and D. Bathe *In its* Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 15 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-24108# Joint Publications Research Service, Arlington, Va.
EFFECT OF APPARENT FLUID MASSES ON NATURAL VIBRATION FREQUENCIES OF IMPELLERS OF MULTISTAGE CENTRIFUGAL PUMPS Abstract Only
D. V. Grokhovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 72 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 4, Apr. 1983 p 11-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24114# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN OPTIMALLY DESIGNING SHELLS OF REVOLUTION Abstract Only
N. V. Banichuk and V. V. Kobelev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 76 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 2, Feb. 1983 p 10-17 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24115# Joint Publications Research Service, Arlington, Va.
REACTION OF PIEZOCERAMIC SHELL TO CONCENTRATED FORCES Abstract Only
L. A. Filshtinskiy and L. A. Khizhnyak *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 76-77 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 478-482 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24119# Joint Publications Research Service, Arlington, Va.
TWISTING OF SEGMENTAL SHAFTS Abstract Only
L. V. Konovalov, L. N. Kukleva, A. I. Sanzharevskiy, and M. D. Vinogradova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 79 Transl. into ENGLISH from Vestn. Mashinostroyeniya (Moscow), no. 9, Sep. 1983 p 26-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24137# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF PARAMETERS OF ELASTICALLY STRAINED MIRROR FACETS OF RAPIDLY ROTATING PRISMS Abstract Only
V. S. Trachuk, A. P. Romashkov, and A. F. Kotyuk *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 90-91 Transl. into ENGLISH from Izmerit. Tekhn. (Moscow), no. 9, Sep. 1983 p 42-44 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24138# Joint Publications Research Service, Arlington, Va.
STUDY OF FATIGUE STRENGTH OF SHAFTS WITH SEGMENTED CHANNELS Abstract Only
I. V. Kudryavtsev, N. A. Shokov, and N. M. Savvina *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 91 Transl. into ENGLISH from Energomashinostroyeniye (Moscow), no. 5, May 1983 p 9-11 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24181# Joint Publications Research Service, Arlington, Va.
STRENGTH COMPUTATION OF THIN WALLED SHELL BY DISCREET-CONTINUOUS MODEL Abstract Only
V. G. Shatayev and A. G. Samartsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UED-84-005) 19 Jul. 1984 p 47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekh. (Kazan), no. 2, Mar. - May 1983 p 77-82 (For primary document see N85-24157 14-31)
Avail: NTIS HC A04

42 GEOSCIENCES (GENERAL)

N85-24348# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
PROCEEDINGS OF THE ARGOS USERS CONFERENCE ON DATA COLLECTION AND LOCATION BY SATELLITE
1981 152 p refs Proc. held in San Francisco, 28-29 Oct. 1981

Avail: NTIS HC A08/MF A01

Equipment used in the ARGOS data collection and location system; ARGOS oceanography/offshore projects; glaciology; meteorology; hydrology; and bear and dolphin tracking were discussed. For individual titles, see N85-24349 through N85-24365.

N85-24349# Centre National d'Etudes Spatiales, Toulouse (France).

IMPROVEMENTS BROUGHT ABOUT TO THE SYSTEM SINCE 1978 AND STATEMENTS ON FUTURE DEVELOPMENT c15

A. Goasguen *In its* Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 7 p (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

The ARGOS data collection and platform location by satellite system was improved. The improvements cover one pass location, preliminary altitude location, calculation of the initial frequency, data processing, encoding and sending messages over the Global Telecommunication System, dissemination of weather reports, on-line distribution, and the data bank. Author (ESA)

N85-24350# Polar Research Lab., Inc., Santa Barbara, Calif.

NEW DIRECTIONS IN ARGOS INSTRUMENTATION AT POLAR RESEARCH LAB (PRL) c48

Walter P. Brown and John Anderson *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 15 p refs (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

A TIROS Arctic drifter for iceberg tracking and meteorological data; a buoy for water surface layer tracking; an iceberg tracker; mini ocean buoys; a thermistor string buoy for ocean current profiles; a conductivity buoy; a fishing boat tracker; an ARGOS/NAVSAT buoy for ice packs; an automatic weather station; and a polar bear tracker are described. Author (ESA)

N85-24351# Bristol Aerospace, Ltd., Winnipeg (Manitoba).

FOURIER TRANSFORM OF WAVE DATA ON ARGOS BUOYS c48

W. R. Whitehead *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

An ARGOS buoy which measures ocean waves and performs on-board analysis of the data before it is transmitted is described. Data is collected for 30 min and processed to find the mean heave, largest wave, and average period. Then a Fourier transform of the wave data is computed. The processed data is recorded on cassette tape and transmitted, in summary form, via the ARGOS satellite. Author (ESA)

N85-24352# Department of Environment, Ottawa (Ontario). Atmospheric Environment Service.

THE EDMONTON DATA COLLECTION PLATFORM PROCESSING AND LOCATING FACILITY c35

Colin S. diCenzo *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 7 p refs (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

A real-time ARGOS data collection platform processing station is described. The platform locating algorithm and the data timeliness are outlined. The station demultiplexes and processes data embedded in a high resolution picture transmission stream from AVHRR. The platform position is accurate to within 10 km 89% of the time. Author (ESA)

N85-24353# Toyo Communication Equipment Co. Ltd., Kanagawa (Japan).

THE DEVELOPMENT OF PLATFORM TRANSMITTER TERMINAL (PTT) AND ITS APPLICATION FOR DRIFTING BUOYS c32

Masayuki Tsutsumi *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 9 p (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

A PCM-PSK transmitter to be incorporated into a drifting buoy used in the ARGOS localization and data collection system was designed. It transmits 2 W at 401.65 MHz. A high-stability oscillator and a phase-locked loop circuit provide high frequency stability and enable the platform to be localized to within 1 km. The transmitter consists of two 25 x 9 cm printed circuit boards, a transmission board and a logic control board, weighing together 600 g. Current drain during transmission is 0.7 A. Average power consumption is 0.3 W. Author (ESA)

N85-24354# Scripps Institution of Oceanography, La Jolla, Calif. Inst. of Oceanography.

SURFACE CURRENTS IN THE TROPICAL PACIFIC DURING 1979-1980 USING DRIFTING BUOYS c48

W. Patzert and G. J. McNally *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p ref (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

Results from the 60 satellite-tracked drifting buoys deployed in the NORPAX Hawaii/Tahiti Shuttle Experiment are discussed. Although the primary objective of this project was to describe the variations of the near surface flow in the North Equatorial Countercurrent (NECC) and Current (NEC) on seasonal and shorter time scales, buoys were also deployed in the equatorial waveguide, i.e., 3N to 3S. The NECC exhibits strong annual variations in zonal flow; NECC meandering is present during most of the year; the NEC is steadiest and strongest between 9 and 12N. All buoy trajectories reveal inertial motions with amplitudes of + or - 20 cm/sec, the same amplitude as the mesoscale and annual signals. Author (ESA)

N85-24355# National Oceanic and Atmospheric Administration, Rockville, Md.

US PROGRAMS USING THE ARGOS DATA COLLECTION AND PLATFORM LOCATION SYSTEM

Terry E. Bryan *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 9 p Sponsored in part by NOAA, US Coast Guard and NSF (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

Drifting buoy, constant level balloon, and moored, shipboard and animal tracking system experiments carried out by NOAA, the US Coast Guard, the Office of Naval Research, and the National Science Foundation using the ARGOS data collection and platform location system are summarized. The experiments cover oceanographic, meteorological, pollution monitoring, Arctic region, and atmospheric studies. Author (ESA)

N85-24356# Beak Consultants Ltd., Richmond (British Columbia).

INFERENCES OF FUTURE OPERATIONS DRAWN FROM PAST AND PRESENT APPLICATIONS OF DRIFTING BUOYS c48

Noel E. J. Boston *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p refs (For primary document see N85-24348 14-42)

Avail: NTIS HC A08/MF A01

In the subarctic North Pacific, drifting buoys are investigated as a mean of replacing the data gathering capabilities of ocean weather station P (or ship PAPA). In the eastern Arctic, drifting buoys provide current data in the ice and iceberg infested waters of Davis Strait. The intergovernmental oceanographic commission, and the World Meteorological Organization, are investigating meteorological and oceanographic applications of drifting buoys which may provide products to incorporate into Integrated Global Ocean Station System. Local studies are responses to immediate needs and tend to be industry oriented and supported. Regional studies are related to national interests (weather, fisheries) and are sponsored by national governments. Global studies have applied and basic research applications which require international support. A center which assists in operations, is a clearing house of information, coordinates studies, and disseminates data is seen as the next development in drifting buoy technology. Author (ESA)

N85-24357# Washington Univ., Seattle. Polar Science Center.
SEA-ICE MOTION IN RESPONSE TO GEOSTROPHIC WINDS **c48**
Roger Colony *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p refs Sponsored in part by NSF and Navy (For primary document see N85-24348 14-42) (Grant NOAA-NA80-AA-D-00015)
Avail: NTIS HC A08/MF A01

About 25 ARGOS drifting buoys were deployed on Arctic sea ice. The observations of position and atmospheric pressure were used to deduce the sea ice motion and the geostrophic wind. A linear relationship between the ice velocity and the geostrophic wind is found to account for 75% of the variance of the ice motion. The observations are also used to infer the upper level ocean currents. Author (ESA)

N85-24358# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. Data Buoy Office.
US PROGRAM IN ANCHORED DATA BUOY AND THE OTHER FIXED OBSERVATION PLATFORMS **c35**
Jerry C. McCall *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 11 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

The NOAA Data Buoy Office (NOBO) develops and operates moored buoys in all U.S. coastal and offshore waters from New England to Hawaii (including the Great Lakes) to provide real-time environmental measurements in data-sparse areas for the National Weather Service and other public and private users. The NOBO also has a program for development, deployment, and operation of drifting buoys, which provide environmental measurements in the South Atlantic and Pacific from Chili to Australia and in the Northern Hemisphere. In addition, NOBO develops, deploys, and operates special purpose environmental measuring systems for other government agencies, particularly for petroleum-related purposes, and has an engineering development effort in procuring new and improved sensor and communications systems.
Author (ESA)

N85-24359# National Research Inst. for Oceanology, Stellenbosch (South Africa).
ONE THOUSAND DAYS IN THE BRINE **c48**
C. C. Stavropoulos and P. A. LeRoux (South African Weather Bureau, Pretoria) *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 11 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

Twenty-three satellite tracked ARGOS drifting buoys were deployed in the Southern Ocean. The buoys continue working for > 1000 days, with no instrument problems or broadcasting failures, but a high loss rate due to bad handling and electronics deficiencies is reported. The contribution of one buoy to meteorological data acquisition in the southern hemisphere is outlined. Author (ESA)

N85-24360# Wisconsin Univ., Madison. Dept. of Meteorology.
AUTOMATIC WEATHER STATIONS IN ANTARCTICA **c47**
Michael L. Savage, Charles R. Stearns, and C. Teague (Stanford University, California) *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 10 p refs Sponsored by NSF (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

Twelve automatic weather stations to measure surface air temperature, pressure, wind speed, and wind direction were deployed in Antarctica. The stations utilize the ARGOS data system aboard TIROS-N and NOAA satellites for data delivery. Each station consists of a 3m tower supporting the sensors and an electronics enclosure containing a microcomputer and the ARGOS transmitter. Six stations use radiosotope thermoelectric generators for power. The others use storage batteries and a solar panel for battery charging. The stations transmit 256 bits of data every 200 sec. The sensors are interrogated every 10 min and 50 min of stored data is contained in each transmission. Each station is visible to the satellite for 10 min of the 101 min orbit. The stations, operating since 1979, successfully endure temperatures of -75 C and winds of 39 m/sec. The station located at Dome Charlie performs flawlessly despite the mean annual temperature of -52 C.
Author (ESA)

N85-24361# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE 1981 TRANSATLANTIC BOAT RACE CONTRIBUTION FOR MARINE METEOROLOGICAL MEASUREMENTS **c47**
R. Rolland *In its* Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

The commercial and scientific benefits of ARGOS participation in yacht races are discussed. Besides promotion of the system, use of ARGOS is a way to gain knowledge on system operation: concentrating > 100 platforms in a single departure port, distributing a mass of results to scattered users are problems that Service Argos must solve. The system implemented for races prefigures the Sargos System; it is a way to demonstrate its efficiency in search and rescue. As the systems are very similar, improvements to one system are useable for the second. Races are also an opportunity to test and demonstrate the usefulness of mini automatic weather stations. Publicity via the media and the fact that crews rely on the increased safety provided by the system prove to be a forceful stimulus to improving equipment reliability in addition to the capabilities of the processing center and distribution system. Author (ESA)

N85-24362# Department of Environment, Ottawa (Ontario). Atmospheric Environment Services.
THE DEVELOPMENT OF AN AUTOMATED MARINE METEOROLOGICAL DATA SYSTEM **c47**
R. Vockeroth *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 8 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

A real-time meteorological data buoy system using FGGE-type drifting buoys and an ARGOS local user terminal were developed. Expansion of the system to include anemometer buoys and shipboard automatic platforms is discussed. Projected operating costs are given. Author (ESA)

N85-24363# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).
AUTOMATIC HYDROLOGICAL DATA COLLECTION FACILITY USING ARGOS **c43**
Bernard Fromantin *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 4 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

A limnograph-ARGOS beacon interface card to overcome the problem of irregular satellite passages was developed to allow river level to be measured every 30 min and 16 sites to be measured simultaneously. The card stores 14 successive limnograph measurements in the memory, eliminating the most dated one each time.
Author (ESA)

N85-24364# National Marine Fisheries Service, La Jolla, Calif. Southwest Fisheries Center.
TRACKING PELAGIC DOLPHINS BY SATELLITE **c17**
Jacqueline G. Jennings and Raymond K. Stives *In* CNES Proc. of the ARGOS Users Conf. on Data Colection and Platform 1981 6 p refs (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

Two dolphins fitted with transmitter packs were tracked by plane and satellite for 1 week. The plane was equipped with a receiver similar to that onboard the satellite, but modified to serve as an automatic direction finder. Ground truth was collected from the plane during the orbits. The transmitter pack prototype weighed 907 gm and was packaged in 2 cylinders, measuring 17.5 x 5 cm. To conserve batteries, the units were clocked on daily for 4 hr, corresponding to the best satellite orbits. The 1 W antenna was

mounted on a pedestal. Satellite position determinations are 2 to 10 km from actual locations. The packs must be reduced in diameter for longterm application to pelagic dolphins.Author (ESA)

N85-24365# British Columbia Univ., Vancouver. Faculty of Forestry.
POLAR BEAR TELEMETRY RESULTS FROM THE NIMBUS-6 SYSTEM c17
Mitchell K. Taylor, D. P. DeMaster, S. P. Sheldon, F. Sorenson, P. B. Latour, J. Lee, R. E. Schweinsburg, T. Larsen, C. Jonkel, and C. Vibe *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 26 p refs Sponsored by US Fish and Wildlife Service National Laboratory, Minnesota University, Canadian Wildlife Service, Northwest Territories Wildlife Service, Norsk Polar Institutt and Danish Zoologisk Museum (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

Satellite telemetry studies of polar bear movements were implemented in Alaska, the Canadian High Arctic, and the Greenland Sea using the Nimbus-6 RAMS system and a transmitter collar. System problems, inconsistent instrument performance, and premature attachment harness failure reduced the information obtained. A northeasterly movement of Alaskan polar bears is noted in early spring. Canadian polar bears demonstrate an ability for long distance movements but tend to remain close to the site of capture. Instrumented polar bears in the Greenland Sea move long distances in sustained directions, indicating an ability to navigate and escape the powerful east Greenland current. Field test results indicate that a transmitter and attachment developed for TIROS system is fully operational. Author (ESA)

N85-24366# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
DATA COLLECTION AND PLATFORM LOCATION BY SATELLITE: ARGOS USERS' CONFERENCE
1982 196 p refs Partly in FRENCH and ENGLISH Conf. held at Paris, 20-22 Apr. 1982
Avail: NTIS HC A09/MF A01

Use of the ARGOS satellite data collection and platform location system in oceanography, meteorology, biology, and hydrology was discussed. Maritime applications and ARGOS equipment were described. For individual titles, see N85-24367 through N85-24390.

N85-24367# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM MAIN CHARACTERISTICS c15
J. L. Bessis *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 1-10 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The ARGOS satellite based localization system is described. The user platform weighs only 2 kg, so can be carried by a wide range of targets, e.g., balloons, icebergs, or animals. The platforms are linked to NOAA satellites, which act as relay stations for platform and satellite environmental and experiment data. Special ground stations were built for direct data collection. The localization system is based on Doppler positioning, with 60% of platforms located at each satellite passage. Accuracy is within 100 m. The data processing system assures 99% availability of data; 66% of the data are available < 3 hr after measurement, 87.5% < 6 hr. Information includes raw and converted sensor data, and position, speed, and last localization date of platforms. Real time data transmission is assured by the Global Telecommunication System. Projects include meteorology, oceanography, and glaciology. Author (ESA)

N85-24368# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS SYSTEM AFTER 3 YEARS OPERATION c15
M. Taillade *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 11-23 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The ARGOS data collection and platform location contribution to the NOAA-TIROS program is reviewed. Of 100 platforms seen during each orbit, 60 are correctly located. Average location accuracy is 500 m. Environmental data collection for atmospheric, oceanographic, and Earth sciences is increasing with each year of system operation. Financial and promotional aspects of Service ARGOS are outlined. Author (ESA)

N85-24369# Centre National pour l'Exploitation des Oceans, Brest (France). Dept. Etudes Oceaniques.
EVALUATION OF WAVE ENERGY RESOURCES ON THE FRENCH ATLANTIC SEABOARD c48
Michel Ollitrault and J. M. Coudeville *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 27-35 ref In FRENCH; ENGLISH summary Sponsored by Operation Energie des Mers (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

A network of three wave buoys was deployed between the Glenans Archipelego and the mouth of the Gironde river (France) to determine potential wavepower resources. The buoys were fitted with accelerometers and spectral analyzers generating a sea state spectrum every hour, transmitted to the ARGOS system. The mean annual power per meter calculated from these spectra is 16kW/m. The result is the same for the three sites (to within a few percent). The mean daily power can vary between several kW/m and 100kW/m as a result of wind and ground swells. Author (ESA)

N85-24370# National Museum of Natural History, Paris (France). Lab. d'Oceanographic Physique.
THE INDIAN OCEAN SURFACE DYNAMICS EXPERIMENT (SINODE) c48
G. Reverdin, M. Fieux, and J. Gonella *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 37-42 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Oceanic surface circulation in the equatorial region of the Indian Ocean was studied using drifting buoys tracked by the ARGOS system. The experiment reveals equatorial Rossby waves in the eastern part of the ocean, resulting in a reversal of the direction of ocean circulation. Seasonal variations of the Wyrtki jet were studied. The width of the area concerned is 300 km, with average speed > 1 m/sec. Author (ESA)

N85-24371# Centre d'Etudes de Meteorologie Spatiale, Lannion (France). Centre de Meteorologie Maritime.
THE ARGOS CONTRIBUTION TO THE FIRST GARP GLOBAL EXPERIMENT (FGGE) STUDY OF DRIFTING BUOYS c48
N. Daniault *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 43-52 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Over 300 drifting buoys released during the First GARP Global Experiment were tracked by the ARGOS system. Tracking of the trajectories of the buoys enabled the gross features of the Southern Hemisphere ocean circulation to be plotted, and detected secondary features such as inertial oscillations, quasi geostrophic eddies, meanders, and the existence of an oceanic signal. Study of the geographical distribution of the kinetic energy of mean and eddy currents can reveal the mechanisms that generate eddy currents. Comparison with wind file data can be used to examine wind-current relations over the entire Southern Ocean. Author (ESA)

N85-24372# National Museum of Natural History, Paris (France). Lab. d'Oceanographique Physique.
MAIN FEATURES OF ANTARCTIC OCEAN CIRCULATION AS REVEALED BY SATELLITE TRACKING OF ICEBERGS c48
P. Tchernia *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 53-61 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Seventeen iceberg trajectories of length 2000 to 5000 nautical miles in the Antarctic Ocean were tracked by ARGOS system satellites. They reveal connections between east wind drift currents and west wind drift currents. The circle of gyration between the two parallel but contrarotating drift currents is 250 to 300 nautical miles in the Weddel and Ross seas. In the 90 deg E area it is 50 nautical miles. This difference may be linked to the topography of the western end of the Antarctic Indian Basin. The Kerguelen Plateau, which marks the boundary between the Atlantic Indian Basin and the Indian Basin proper, is isolated, leaving a passage at its southernmost end (Challenger Strait) 50 to 110 nautical miles wide. In the northern part of this strait current flows from west to east. An area of turbulence downstream of the plateau may be responsible for the small radius interconnection in the 90 deg E area. Author (ESA)

N85-24373# National Oceanic and Atmospheric Administration, Washington, D. C. Special Research Programs Office.

A LARGE-SCALE AIR SEA INTERACTION PROJECT OVER THE PACIFIC BASIN c47

Rex J. Fleming *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 67-84 refs (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

A study of relations between the Southern Oscillation, El Nino, and the Walker Circulation and atmospheric changes is discussed. A 10 yr Basin Monitoring Activity includes measuring the wind field, surface heat and moisture fluxes, sea level, and the thermal structure in the upper ocean. Specific observations of these parameters will build upon existing observing programs. However, much of the Pacific is not adequately observed in the ocean or the atmosphere and an array of buoys will be deployed to fill the most critical data-void areas. Author (ESA)

N85-24374# Direction de la Meteorologie Nationale, Magny les Hameaux (France). Etablissement d'Etudes et de Recherches Meteorologiques.

METEOROLOGICAL BUOYS DEVELOPED AT THE EERM LABORATORY c47

Vladislav Klaus *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 85-99 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Moored and drifting meteorological buoys were developed. The Marisonde B drift buoy transmits atmospheric pressure and sea surface temperature data via the ARGOS system. The Navisonde fast drifting buoy measures pressure, sea surface temperature, and wind speed. The Marisonde G is bigger than the others, collecting air temperature and wind direction in addition to the previous parameters. The Marisonde RC is a moored automatic weather station for synoptic meteorology. The Marisonde H is a wave buoy, giving height and mean period in real time.
Author (ESA)

N85-24375# Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie et Geophysique de l'Environnement.

ATMOSPHERE ICE-OCEAN INTERACTIONS IN THE ANTARCTIC (IAGO) c47

A. Poggi, D. Delaunay, H. Hallot (Ecole Nationale de la Meteorologie), and G. Wendler (Alaska Univ., Fairbanks) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 101-111 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

A network of meteorological stations was set up in the Antarctic to study radiative cooling of the surface, which causes a thin layer of cold air to form and to move over the sloping landforms under the effect of gravity. The surface flow results in an air deficit over the center, provoking a compensating flow from the ocean. The stations measure the mean wind and air temperature profiles over a height of 20 m, as well as wind direction at the top and base of the towers and air pressure. Wind speed and direction and air pressure and temperature are also measured at a height of 3 m. Diurnal variation data are presented and a model of diurnal variations is derived. Author (ESA)

N85-24376# Rijkswaterstaat, The Hague (Netherlands). Data Processing Div.

THE ARGOS COMMUNICATIONS PERFORMANCE TRIALS c32

Jan Looyen *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 113-123 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The ability of the ARGOS system to satisfy user requirements on data communication links for coastal and seaborne meteorological and hydrological buoys was assessed. The telemetry systems were designed for real time operation, imposing extra constraints on transmission delay times. Results show that ARGOS time delays exclude its use in a real time network. The time between passes creates gaps in data transmission. However, ARGOS is highly reliable, with good documentation and service, and the transmission ratio is good. Author (ESA)

N85-24377# Centre National d'Etudes Spatiales, Toulouse (France). Div. Balloons.

LOCATION AND DATA COLLECTION FOR LONG STRATOSPHERIC BALLOON FLIGHTS c46

P. Malaterre *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 125-134 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Stratospheric balloons capable of taking a 30 kg scientific payload to an altitude of 22 to 30 km for 1 month or more were developed. In-flight experiments were used to qualify the designs of a pumpkin shaped superpressure balloon and an infrared hot air balloon. Tracking of the flights (location and transmission of the parameters measured on board) was achieved using a telemetry gondola including an ARGOS beacon adapted for operation in the low temperatures encountered. Author (ESA)

N85-24378# Aberdeen Univ. (Scotland). Zootelemetry Research Lab.

DEVELOPMENT OF ARGOS PLATFORMS FOR TRACKING OF BASKING SHARKS. CETORHINUS MAXIMUS c46

I. G. Priede *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 137-143 refs (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

An ARGOS system platform transmitter terminal was developed for tracking basking sharks, which feed on the same planktons as commercially interesting fish. The platform is water tight to a depth of 400 m. An antenna-transmitter capsule capable of withstanding impact damage from, e.g., blows from the shark's tail, was designed. The unit floats with the top surface only 2 cm clear of the water to minimize buoyancy effects when the shark dives. Tests show that the location accuracy is 1 km. It was not possible to attach the platform to a shark. Author (ESA)

N85-24379# Museum d'Histoire Naturelle et d'Ethnographie, La Rochelle (France).

TRANSATLANTIC MIGRATION STUDY OF THE LEATHERY TURTLE USING THE ARGOS SYSTEM. TRANSATLANTIC TURTLE RACE c48

Michele Duron-Dufrenne *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 145-150 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The migration of turtles from French Guiana to the Atlantic coast of France is described and the use of the ARGOS system to track them is proposed. The experiment would study the similarity of the French and Guianan biotopes and test the hypothesis of a

dispersion of the largest population of the turtle towards other continents. Author (ESA)

N85-24380# Toba Merchant Marine Coll. (Japan). Dept. of Oceanography.
THE TRANSPACIFIC EXPERIMENTAL SAILING BY YASEIGO 3 c31
Hiroaki Ochiai, Shoji Takeuchi (Remote Sensing Technology Center of Japan), Haruki Kadokawa (Society of Ancient Pacific Cultures), Kazunobu Fujimoto (Society of Ancient Pacific Cultures), and Muneyuki Matsui (Society of Ancient Pacific Cultures) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 153-158 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The ARGOS system was used to communicate with a double canoe built to an ancient design which sailed from Japan to California to test theories about Japanese castaways and early Pacific cultures. The craft took 51 days to complete the 4374 mile journey, at speeds up to 10 kt. The effectiveness of ARGOS for monitoring vessel location, sea state and crew condition, and detection of oceanographical information is demonstrated. In the evaluation of the scientific investigations such as detection of sailing distance or sailing speed, the frequency of data acquisition should be increased. Data transfer through the telex can be reduced. The emergency signal was not transmitted. Author (ESA)

N85-24381# National Museum of Natural History, Paris (France). Lab. d'Oceanography Physique.
THE ARGOS CONTRIBUTION TO THE SUCCESSFUL DREDGING OF A DEEP MOORED CURRENT METER c31
J. Gonella and B. Olivier (ORSTOM) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 159-164 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

Current meters moored at 1200 m from a seabed 4600 m deep in the Indian Ocean were recovered using the ARGOS system after failure of the explosive anchor-release bolts prevented recovery using acoustic methods. The position of each mooring was known to within 0.25 nautical miles, so the ARGOS system was used to position the recovery ships to within 100 m of the targets. Author (ESA)

N85-24382# Centre National pour l'Exploitation des Oceans, Brest (France). Service des Operations Navales.
THE ARGOS SYSTEM ABOARD RESEARCH VEHICLES: 1981 EXPERIMENT ABOARD THE LE SUROIT OCEANOGRAPHIC VESSEL AND THE OUTLOOK c04
J.-P. deLongueau *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 165-168 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42) (CNEXO/DFT/OPNAV/82-05) Avail: NTIS HC A09/MF A01

Platform transmitter terminals for the ARGOS system were placed aboard an oceanographic research ship for a series of dives of a submersible. Comparison of the positions received by the shore station via ARGOS with those calculated at sea using shipboard equipment demonstrate the reliability of ARGOS. Author (ESA)

N85-24383# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
MISCELLANEOUS ARGOS MARITIME APPLICATIONS c48
R. Rolland *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 169-175 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The commercial and scientific benefits of ARGOS participation in yacht races are discussed. Besides promotion of the system, use of Argos is a way to gain knowledge on system operation: concentrating > 100 platforms in a single departure port, distributing a mass of results to scattered users are problems that Service Argos must solve. The system implemented for races prefigures the Sargos System; it is a way to demonstrate its efficiency in search and rescue. As the systems are very similar, improvements to one system are useable for the second. Races are also an opportunity to test and demonstrate the usefulness of mini automatic weather stations. Publicity via the media and the fact that crews rely on the increased safety provided by the system prove to be a forceful stimulus to improving equipment reliability in addition to the capabilities of the processing center and distribution system. Author (ESA)

N85-24384# Centre National d'Etudes Spatiales, Toulouse (France).
THE SINKING OF THE LES MUTUELLES DU MANS TRIMARAN c15
M. Yokel *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 177-180 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The crew of a trimaran which capsized during a transmediterranean race were saved by rescue services thanks to their ARGOS beacon. Author (ESA)

N85-24385# Centre National d'Etudes Spatiales, Toulouse (France).
THE SARSAT PROGRAM c15
D. Ludwig *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 181-191 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The SARSAT/COSPAS satellite network uses 121.5 and 406 MHz buoys to locate ships and aircraft in distress. The 121.5 MHz system, obligatory on many aircraft, gives localization to within 10 km, and, despite being subject to considerable radio interference and a poor signal to noise ratio, is responsible for saving nearly 200 lives. The 406 MHz location error is < 2 km in 75% of cases, and < 2 hr for 95% of cases in the worst conditions. It suffers however from interference from illegal broadcasts in the frequency band. Author (ESA)

N85-24386# Electricite de France, Grenoble. Div. Technique Generale.
MEASUREMENT OF WATER EQUIVALENT OF MOUNTAIN SNOW COVER c43
P. Guillot *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 195-199 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The ARGOS system was used to transmit daily high mountain snow layer measurements from areas of the Alps and Pyrenees too isolated to be connected to the wire network, and too deep in the surrounding relief to allow ground-ground VHF links. The good performance of the ARGOS system led to ARGOS beacons being used with a network of profiling horizontal radioactive snow gages, which records the snow layer density profile once a day. Author (ESA)

N85-24387# Groenlands Tekniske Organisation (Denmark).
HYDROLOGY AND CLIMATIC CONDITIONS IN GREENLAND c47
N. V. Soerensen *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 201-207 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

The use of the ARGOS system in Greenland to transmit data from automatic weather stations and hydrological monitors is discussed. The climatology-hydrology network was installed to study the possibility of using hydroelectricity to replace other fuels for electric power generation, but access is difficult due to the harsh weather and difficult terrain. The ARGOS system is the most cost effective way of collecting data. Author (ESA)

N85-24388# Swedish Meteorological and Hydrological Inst., Stockholm.

HYDROLOGICAL DATA COLLECTION FROM SWEDISH MOUNTAIN AREAS c43

Gunloeg Wennerberg *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 209-213 refs (For primary document see N85-24366 14-42)

Avail: NTIS HC A09/MF A01

Swedish mountain stations transmit air temperature, precipitation and water level data. They are installed in remote areas and operate under severe conditions. The system of transmitting via satellite results in demands and possibilities of sensor equipment. Pressure sensors can be used to measure water level at stations without stilling wells and access to electricity. The ARGOS system means that automatic field stations can be set up in places without access to electricity or the telephone network, for hydrological runoff prediction. Author (ESA)

N85-24389# Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).

THE ARGOS SYSTEM AND HYDROLOGY: THE USE OF PLATFORM TERMINAL TRANSMITTER (PTT) WITH BUILT-IN MEMORY AND DIRECT RECEPTION BY THE SEINE BASIN HYDROLOGY SERVICE c43

J. Callede, J. Rentiere, and Y. Rouquerol *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 215-224 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)

Avail: NTIS HC A09/MF A01

An ARGOS platform transmitter terminal (PTT) with the entire ARGOS message capacity (256 bits) available in a built-in memory was built and deployed in the Seine basin. The PTT was linked to a direct reception ARGOS station to eliminate the time delay caused by transmitting via ARGOS centers. The station receives fewer messages than the complete ARGOS system, partly due to the use of an omnidirectional receive antenna. There is a good degree of redundancy in the water level data, corresponding to any given hour of data collection time, the exact degree of redundancy depending on the time of day. The experiment shows that the direct readout station provides timely data for forecasting and network management requirements, but that the DISPOSE file should be used if all 48 daily observations are required.

Author (ESA)

N85-24390# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).

DIRECT READOUT AND DISSEMINATION OF RESULTS USING ARGOS KEYPAD TERMINALS c32

D. Bernadet *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 227-233 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)

Avail: NTIS HC A09/MF A01

A direct readout station which allows ARGOS users to collect in real time all information from beacons within a 2500 km radius of the station is described. It can receive and process several hundred beacons and is especially suitable for users with networks of beacons within the same geographical area and those who want results after each satellite pass. Cost effective data-dissemination can be assured by installing a manual terminal at the central station. The ARGOS terminal is a beacon which makes it possible to transmit digital information through the keyboard, associated with a microprocessor interface board and an ARGOS type 80 transmitter. Maintenance is simplified compared with traditional radio systems since the whole network is achieved with the same equipment. Author (ESA)

N85-24391# Centre National d'Etudes Spatiales, Toulouse (France).

DATA COLLECTION AND PLATFORM LOCATION BY SATELLITE: ARGOS USERS' CONFERENCE

1982 225 p refs Conf. held at Annapolis, 13-15 Dec. 1982

Avail: NTIS HC A10/MF A01

Use of the ARGOS satellite data collection and platform location system in oceanography, meteorology, biology, and hydrology was discussed. Maritime applications and ARGOS equipment were described. For individual titles, see N85-24392 through N85-24408.

N85-24392# National Environmental Satellite Service, Washington, D. C.

ENVIRONMENTAL SATELLITES c15

Russell Koffler *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 11 p (For primary document see N85-24391 14-42)

Avail: NTIS HC A10/MF A01

The history, status, and future of NASA environmental satellite programs are discussed. The GOES, NOAA, and TIROS-N satellite contributions to meteorology and environmental monitoring are outlined. Author (ESA)

N85-24393# National Environmental Satellite Service, Washington, D. C.

GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE DATA COLLECTION SYSTEM c32

Russell Koffler *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 9 p (For primary document see N85-24391 14-42)

Avail: NTIS HC A10/MF A01

The GOES data collection system (DCS) is described. The DCS is a data relay network using two geostationary satellites. Each satellite has a capacity of up to 233 reply channels at a 100 bit/sec data rate. The individual data collection platforms (DCP) use UHF frequencies for the uplink to the satellite. The data are transponded in the satellite to S-band for relay to the telemetry station, which relays them for distribution by dedicated or dial-in telephone lines to the users. No processing of the data into engineering units is accomplished in this system. The interrogate type DCP replies only when it is interrogated from the ground system through the satellite. The self-timed DCP replies on an assigned time from an internal clock. A data acquisition and monitoring system allows users to monitor each DCP through diagnostic information appended to each message. A random reporting feature was added allowing DCP's to relay data at unscheduled times over the same reply channel. Author (ESA)

N85-24394# National Environmental Satellite Service, Washington, D. C. Information Processing Div.

NOAA'S ROLE IN SUPPORT OF SERVICE ARGOS c32

A. Shaw *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 7 p (For primary document see N85-24391 14-42)

Avail: NTIS HC A10/MF A01

The TIROS-N-ARGOS data network is described. Data from the geostationary and polar satellite systems are transmitted to the satellite data processing center (DPC) in real time and are conditioned for distribution and archive on a schedule concurrent with spacecraft readout. The processing capability is inadequate and the system is limited in the amount of data and time it can process. As a result, the delivery of data collection data and derived products requires $>$ 2 hr after receipt of the data at the DPC. Modifications for improving system performance are described.

Author (ESA)

N85-24395# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.

SERVICE ARGOS TECHNICAL REPORT AND IMPROVEMENT c32

A. Goasguen *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 23 p (For primary document see N85-24391 14-42)

Avail: NTIS HC A10/MF A01

Performance of the ARGOS data processing center is discussed. Long outages at the beginning of 1982 were overcome and the situation returned to normal. Difficulties in the distribution function are under improvement after a software team started to work on the problem. The connection of a VHF direct readout station directly to the ARGOS data processing center would ensure fast system response for all platform terminal transmitters within

the station's coverage, i.e., Europe and the NE Atlantic. Trial results are presented. Development of a solar array power pack suitable for all ARGOS PTTs and, in particular, for the CML 80 units used in promotional activities is outlined. Author (ESA)

N85-24396# National Data Buoy Center, Bay Saint Louis, Miss.
DRIFTING BUOY STUDIES FOR WEATHER APPLICATIONS c47
Edmund G. Kerut *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

Drifting buoys deployed in the Southern Hemisphere for the Global Weather Experiment improved weather analyses and forecasts dramatically. Buoys deployed in the Storm Transfer and Response Scientific Experiment (STREX) did not improve weather analyses and forecasts to the degree of the data from buoys in the Southern Hemisphere. The STREX array was limited with small spacing, and consequently could improve analyses only over a rather limited area. A larger, more widely dispersed array in the Pacific would be more effective for weather operations. Many of the buoys reported unreliable data, therefore reducing the number of useful data buoys from 24 to 12. This, however, is a minor consequence because of the dense array spacing. The overall experimental results are sufficiently encouraging to propose operational drifting buoy programs for North American continent weather activities. Author (ESA)

N85-24397# Wisconsin Univ., Madison. Dept. of Meteorology.
ANTARCTIC AUTOMATIC WEATHER STATIONS c47
Charles R. Stearns *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 16 p refs (For primary document see N85-24391 14-42)
(Grant NSF DPP-79-25040)
Avail: NTIS HC A10/MF A01

Thirteen computer-based weather stations which telemeter every 200 sec to the ARGOS system on polar orbiting satellites were set up in the Antarctic. The data tapes are received biweekly from Service ARGOS. Less than 1% of the data is questionable and this is not related to the data link. Usually three identical messages are received so the ARGOS system can be more fully utilized by transmitting a sequence of up to three different messages, thus increasing the amount of data collected. This requires reprogramming the read-only-memory in the weather station and modifications to the microprocessor. Meteorological time series show excellent data coverage in a remote area which is superior to the coverage available in the United States.
Author (ESA)

N85-24398# Atmospheric Environment Service, Toronto (Ontario).
COLLECTING METEOROLOGICAL REPORTS WITH THE ARGOS SYSTEM c47
R. Vockeroth and C. diCenzo *In* CNES Data Collection and Platform Location by Satellite: ARGOS User's Conf. 1982 12 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

The Canadian Atmospheric Environment Service undertook to use FGGE type drifting buoys and the ARGOS data collection system on the NOAA satellites to reduce gaps in the coverage of surface data obtained from voluntary observing ships and moored buoys. To obtain the buoy data in real-time for meteorological analysis an ARGOS Local User Terminal (LUT) capability was developed by adding decoding and location computation facilities to the S-band High Resolution Picture Transmission weather satellite receiving station. Experience in using the LUT, and the proposed operation of several such stations around the North Atlantic are discussed. Author (ESA)

N85-24399# Centre National pour l'Exploitation des Oceans, Paris (France).
THE FRENCH OCEAN CLIMATE IN EQUATORIAL ATLANTIC (FOCAL) DRIFTER PROGRAM, 1983-1984 c47
J. Gonella, M. Fieux, A. Kartavtseff, G. Reverdin, C. Colin (ORSTOM), and Y. DuPenhoat (ORSTOM) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 11 p refs Sponsored by Centre National pour l'Exploitation des Oceans and French Programme National pour l'Etude du Climat (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

The French Ocean Climate in Equatorial Atlantic (FOCAL) experiment to study the response of the upper equatorial Atlantic Ocean to atmospheric forcing; the seasonal cycle of the depth of the thermocline; and surface currents in the intertropical zone is outlined. The FOCAL drifting buoys are equipped with thermistor chains and transmit the resulting data by the ARGOS system. The impact of the buoys on the FOCAL and Seasonal Equatorial Atlantic Experiment experimental array was studied in objective analysis simulations, where buoys followed a climatological surface flow, which included the mean seasonal cycle. Results indicate that drifting buoys released in the Eastern Equatorial Atlantic can make a significant contribution in understanding the response of the upper ocean. To achive the required accuracies, at least 20 buoys are needed. Author (ESA)

N85-24400# Rhode Island Univ., Kingston. Graduate School of Oceanography.
THE DEEP DRIFTER PROGRAM c48
T. Rossby and D. Dorson *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 25 p refs (For primary document see N85-24391 14-42)
(Grant NSF OCE-80-10839)
Avail: NTIS HC A10/MF A01

An instrument for studies of subsurface and deep ocean currents which employs the ARGOS system to determine the pop-up point of the drifter at the end of its mission is described. The instrument is 2 m long and weighs 12 kg. The entire electronics package including the quad-helix antenna fits inside a standard 7.5 cm ID glass pipe, which provides the flotation. In situ pressure and temperature information is collected with a CMOS microprocessor for later broadcast to ARGOS at the surface. The RF link at the surface is very reliable; even in heavy weather 50% of the transmissions are received correctly. Two subsurface tests were conducted successfully in the Gulf Stream: 7 days at 400 m and 5 days at 1700 m. Author (ESA)

N85-24401# National Oceanic and Atmospheric Administration, Rockville, Md.
US PROGRAMS USING THE ARGOS DATA COLLECTION AND PLATFORM LOCATION SYSTEM
Terry E. Bryan *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 10 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

Drifting buoy, constant level balloon, and moored, shipboard and animal tracking system experiments carried out by NOAA, the US Coast Guard, the Office of Naval Research, and the National Science Foundation using the ARGOS data collection and platform location system are summarized. The experiments cover oceanographic, meteorological, pollution monitoring, Arctic region, and atmospheric studies. Author (ESA)

N85-24402# Woods Hole Oceanographic Institution, Mass.
TELEMETERED METEOROLOGICAL AND ENGINEERING DATA FROM A DEEP SEA MOORED BODY IN THE LONG TERM UPPER OCEAN STUDY (LOTUS) c17
Clara Deser *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

The Long Term Upper Ocean study (LOTUS) experiment was designed to examine weekly, monthly and seasonal variability in air-sea interaction processes at a site in the Sargossa sea. The experiment employs a moored buoy as a platform for meteorological and oceanographic instrumentation. Engineering data, such as tension of the mooring line and battery voltage, and meteorological data are telemetered via the ARGOS satellite system. The ARGOS

system provides buoy position and a precise timeword. The telemetered data are used for monitoring the meteorological conditions at the LOTUS site. Instrument performance is also checked. If the mooring line fails as it did during a prior engineering deployment, the buoy can be tracked using the ARGOS system.
Author (ESA)

N85-24403# Oregon State Univ., Newport. Marine Science Center.
TRACKING WHALE MIGRATIONS WITH THE ARGOS SATELLITE SYSTEM **c48**
Bruce R. Mate and James T. Harvey *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 15 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

The surfacing frequency of 10 radio tagged gray whales was analyzed to determine the feasibility of locating this species throughout its migratory range using the ARGOS satellite system. A frequency distribution of the time necessary to complete 6 sequential surfacings at least 43 sec apart was used as a predictive model to estimate the probability of 6 qualified whale surfacings occurring for a satellite pass of any duration. Results suggest that whales tagged with an ARGOS beacon would be monitored at least 75 min per day, with 2 daily location determinations predicted under ideal conditions at the southernmost part of their range. In the northern range, the predicted performance more than doubles.
Author (ESA)

N85-24404# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE ARGOS CONTRIBUTION TO THE DEMONSTRATION OF THE EFFECTIVENESS OF A SATELLITE-BASED SEARCH AND RESCUE SYSTEM **c16**
R. Rolland *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 10 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

The ARGOS system was used during yacht races as a search and rescue aid. Its use resulted in the rescue of several crews and, on certain occasions, of their boats as well. The characteristics and operation of the ARGOS system; and the equipment used and the organization required for ocean yacht races are outlined.
Author (ESA)

N85-24405# Partech Electronics Ltd., St. Austell (England).
PRACTICAL CONSIDERATIONS WHEN USING WATER QUALITY AND STRUCTURE MONITORING SENSORS AS APPLIED TO PORTABLE ARGOS SATELLITE TRANSMITTER EQUIPMENT **c48**
A. Roger Parker *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 7 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

Design criteria for low cost ARGOS transmitter equipment are proposed. The transmitter packages should be able to: withstand extreme weather conditions; house all sizes of ARGOS platform transmitter terminals; incorporate more equipment at a later date; and use car batteries. Water quality sensors should be maintenance-free long term devices, with minimal effects of marine growth. Packages should be of an open pattern to make them less attractive to marine life. Full load-bearing marine quality cables must be used. Power consumption of electromagnetic sensors should be minimized by using time switches to optimize warm-up prior to transmission.
Author (ESA)

N85-24406# Toyo Communication Equipment Co. Ltd., Kawasaki (Japan). Mobile Radio Communication Div.
DRIFTING BUOY DEVELOPMENT AND FUTURE PROGRAMS **c48**
M. Tsutsumi *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 9 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

A drifting buoy for the Kuroshio Current (Japan) survey; a drifting buoy for deep sea temperature measurement; and an ARGOS platform terminal transmitter for tracking dolphins are described.
Author (ESA)

N85-24407# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France). Centre de Gros.
DATA TRANSMISSION USING ARGOS KEYPAD PLATFORM TRANSMITTER TERMINALS (PTT) **c32**
Didier Bernadet *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 5 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

A pocket calculator sized manual terminal was developed to transmit coded data via the ARGOS system. The manual terminal includes a rack containing the electronic cards (type 80 N ARGOS transmitter and a microprocessor card), the power supply, the digital keyboard, an antenna and associated cables. It must be equipped with batteries and powered at 220 or 110 V AC, or 12 or 24 V DC. The average consumption is < 4 W. Messages are visualized while typing, and can be verified throughout the process. A VALID key transfers the message to the principal memory, which is read regularly by the transmitter.
Author (ESA)

N85-24408# Hermes Electronics Ltd., Dartmouth (Nova Scotia).
DEVELOPMENT OF A LOW COST DRIFTING BUOY **c48**
Fred Guptill and B. Thompson (Petro Canada) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p refs Sponsored by Canadian government (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

A buoy that costs up to one-third less than comparable buoys was developed. It can be deployed from either a helicopter or light plane if required, and is one-fifth the weight of a conventional drogued buoy. It can be launched by one person requiring only minimum instructions and no special equipment. It can be transported in one-fifth the volume of the conventional equivalent. Drogue and tether fittings were pull-tested to destruction (at or above 18000 Nt). This gives a safety factor of 50 under computer simulated conditions. The hull was leak-tested in a full-up configuration in water to a depth of 8 m. The electronics payload was subjected to mil-spec vibration testing and temperature cycling down to -40C.
Author (ESA)

N85-24409# Centre National d'Etudes Spatiales, Toulouse (France).
DATA COLLECTION AND PLATFORM LOCATION BY SATELLITE: ARGOS USERS' CONFERENCE
1984 313 p refs Conf. held in Seattle, 21-23 May 1984; sponsored by NOAA, CNES and NASA
Avail: NTIS HC A14/MF A01

Use of the ARGOS satellite data collection and platform location system in oceanography, meteorology, and biology was discussed. Maritime applications and ARGOS equipment were described. For individual titles, see N85-24410 through N85-24423.

N85-24410# National Oceanic and Atmospheric Administration, Rockville, Md.
US PROGRAM USING THE ARGOS DATA COLLECTION AND PLATFORM LOCATION SYSTEM
Terry E. Byran *In* CNES Data Collection and Platform Location by Satellite 1984 10 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

Drifting buoy, constant level balloon, and moored, shipboard and animal tracking system experiments carried out by NOAA, the US Coast Guard, the Office of Naval Research, and the National Science Foundation using the ARGOS data collection and platform location system are summarized. The experiments cover oceanographic, meteorological, pollution monitoring, Arctic region, and atmospheric studies.
Author (ESA)

N85-24411# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Climatic and Atmospheric Research.
THE TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAM (TOGA) c47
J. M. Hall *In* CNES Data Collection and Platform Location by Satellite 1984 35 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

The Tropical Ocean and Global Atmosphere program was designed to investigate seasonal and interannual global climatic variations and to develop techniques for predicting them. Evidence suggests that the most pronounced air/sea interactions affecting climate on these time scales occur in the tropics in association with a systematic large-scale atmospheric pressure fluctuation called the Southern Oscillation. Accompanying these pressure variations are significant changes in tropical and subtropical atmospheric circulation patterns, major shifts in the position of the jet stream, departures in the rainfall patterns in the monsoon regions and the Pacific Basin, and remarkable changes in the equatorial current system and the heat content of the tropical Pacific. The 10 gr program includes a 2 yr intensive monitoring of El Nino. Author (ESA)

N85-24412# National Data Buoy Center, Bay Saint Louis, Miss.
ARABIAN GULF CIRCULATION c48
R. L. Pickett (Naval Ocean Research and Development Activity), R. M. Partridge, J. A. Galt (NOAA, Seattle), and R. A. Arnone (Naval Ocean Research and Development Activity) *In* CNES Data Collection and Platform Location by Satellite 1984 18 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

To help forecast oil spill movements, seven satellite-tracked drifting data buoys were launched in the Arabian Gulf. Their month-long paths were compared to historical data and to a hydrodynamic model. Results show a generally counterclockwise circulation with observed speeds off Saudi Arabia of 20 cm/sec. Author (ESA)

N85-24413# National Center for Atmospheric Research, Boulder, Colo.
A REPORT ON THE DRIFTERS PROGRAM c48
R. Heinmiller (OMNET), J. Masterson, and J. McWilliams *In* CNES Data Collection and Platform Location by Satellite 1984 10 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

A plan for the development and utilization of ocean drifting buoys is presented. The evolution of drifting buoys and status of the drifters program are discussed. A projection of the use of drifting buoys for scientific investigations is outlined. An inexpensive, calibrated Lagrangian drifter, and a modularly configurable, surface flux (i.e., momentum, surface and latent heat, and precipitation), and upper ocean temperature and current (i.e., relative flow) drifter compatible with ARGOS were built. Author (ESA)

N85-24414# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
APPLICATIONS OF ARGOS MEASUREMENTS IN EQUATORIAL PACIFIC OCEAN-ATMOSPHERE INTERACTION STUDIES c47
H. P. Freitag, D. Halpern, and A. Shepherd *In* CNES Data Collection and Platform Location by Satellite 1984 13 p refs Sponsored by NOAA (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

The Equatorial Pacific Ocean Climate Studies (EPOCS) program investigation of processes which generate, maintain, and dissipate the large-scale interannual sea surface temperature (SST) variations centered along the equator in the eastern and central Pacific is introduced. Because the velocity field within 1 to 2 deg of the equator is not geostrophic, moored current measurements are required in the upper ocean to unravel the complex dynamical processes (e.g., Kelvin and Rossby waves; wind-generated mixing; zonal, meridional and vertical advection; undercurrent meandering; air-sea heat and moisture fluxes) influencing SST. The ARGOS position and meteorological measurements used in EPOCS are described. Author (ESA)

N85-24415# Petro-Canada Ltd., Calgary (Alberta).
DRIFTING BUOYS ON THE LABRADOR SHELF c48
J. R. Buckley, W. C. Thompson, D. B. Fissel (Arctic Sciences Ltd., Sidney, British Columbia), and J. R. Birch (Arctic Sciences Ltd., Sidney, British Columbia) *In* CNES Data Collection and Platform Location by Satellite 1984 130 p refs Sponsored by Labrador Group of Companies (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

Six ARGOS satellite-tracked drogued drifters and two moored buoys, which subsequently broke free from their moorings, deployed off Labrador provided near-surface current, air pressure and sea temperature data. Near-surface currents are typically 30 to 50 cm/sec in the current core, and 20 cm/sec elsewhere. Comparisons of the drifter velocity data with a data set of moored subsurface current measurements, obtained at depths of 52 to 102 m, shows that the near-surface velocities are on average twice the magnitude of those at depth. However, the steadiness of the currents as indicated by the ratio of vector average velocity to mean speed is in good agreement for the two data sets. A study of the internal consistency of air pressure data reveals significant differences among individual drifters. However, using a median averaging technique, typical random uncertainties are < 1 mbar. Author (ESA)

N85-24416# Computer Sciences Corp., Bay St. Louis, Miss.
MOORED BUOY STATIONKEEPING AND LOCATION SYSTEM c04
R. F. Garrand *In* CNES Data Collection and Platform Location by Satellite 1984 16 p refs (For primary document see N85-24409 14-42)
(Contract NOAA-NA-80-QA-C-101)
Avail: NTIS HC A14/MF A01

A reliable deep-ocean moored buoy stationkeeping and location system utilizing the Service ARGOS locating capability was made operational by the NOAA Data Buoy Center because of the need for an improved method with a faster response for detecting when buoys are adrift and for tracking and recovering an adrift buoy. Watch circle radii and locations are calculated and then validated by plotting periodic and seasonal changes in the moored buoy locations. Ongoing analyses are accomplished using computer plots generated from the buoy stationkeeping data base. Correlations with LORAN-C data availabe from several buoys indicate negligible differences in mean calculated buoy locations. Author (ESA)

N85-24417# Synergetics International, Inc., Boulder, Colo.
A NEW VERSATILE ARGOS PTT FOR OCEANOGRAPHIC APPLICATIONS c48
R. Chris Roark, Paul Ferris Smith (Ferranti O.R.E., Inc., Falmouth, Mass.), and Daniel E. Frye (Ferranti O.R.E., Inc., Falmouth, Mass.) *In* CNES Data Collection and Platform Location by Satellite 1984 12 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

An ARGOS platform electronics system based on technology of 400 MHz GOES synthesized transmitters was developed. The electronic subsystem is flexible enough to interface to a variety of oceanographic/meteorological sensors, with a cost/performance ratio suitable for cost sensitive applications. Flexibility is achieved through the use of optional on board integrated circuits to provide analog and event counter inputs. Without any optional sensor interface circuits, the platform accepts 5V ASCII serial data into the transmission buffer asynchronously, and transmits this data to the polar orbiting ARGOS satellite. The required ARGOS System protection from malfunctioning is provided, and all standard transmission repetition rates and message data lengths are supported. Platform ID and all the setup parameters can be set by switches, jumpers, via the serial data interface, or directly from the CMOS EPROM. Author (ESA)

N85-24418# Atmospheric Environment Service, Downsview (Ontario).
OVERVIEW OF DATA PROCESSING AT AES LOCAL USER TERMINALS **c32**
W. Hume and H. Kagawa *In* CNES Data Collection and Platform Location by Satellite 1984 6 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

The Canadian Atmospheric Environment Service undertook a multiyear program designed to offset the loss of weather data from weatherships at Ocean Station P in the northeast Pacific. The program includes the development and maintenance of a network of drifting buoys in the northeast Pacific, and the installation of an ARGOS Direct Readout Station, and a GOES VISSER readout station. Expansion of the buoy and computing systems is discussed. The status of the Pacific, Atlantic, Arctic, and Hudson Bay projects is summarized. Author (ESA)

N85-24419# Magnavox Electronic Systems Co., Fort Wayne, Ind.
THE DATA ACQUISITION CONTROL AND TELEMETRY (DACT) SYSTEM **c17**
W. H. Serstad *In* CNES Data Collection and Platform Location by Satellite 1984 11 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

The Data Acquisition Control and Telemetry platforms are deployed as remote meteorological stations in the Coastal Automated Network of the U.S. National Weather Service. The platform transmits data in a WMO format suitable for computer handling without further processing, and directly readable by human operators. System hardware and software is modular to permit easy reconfiguration of the platform as operational needs change. The platform is convertable for use as either a fixed station or a buoy system. Two way communication with the platform is available for fixed stations which are near telephone lines by inserting an optional modem. Each of the analog sensor channels contains scaling coefficients which can adjust the output in accordance with a second order equation, thereby eliminating the incompatibilities of many of the sensor types that may be used. Operation is under software control and can be modified from the test set or from a remote location in the case of modem equipped platforms. Author (ESA)

N85-24420*# Science Systems and Applications, Inc., Seabrook, Md.
SOME METHODS OF COMPUTING PLATFORM TRANSMITTER TERMINAL LOCATION ESTIMATES **c32**
C. M. Hoisington *In* CNES Data Collection and Platform Location by Satellite 1984 14 p refs Sponsored by NASA. Goddard Space Flight Center (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

A position estimation algorithm was developed to track a humpback whale tagged with an ARGOS platform after a transmitter deployment failure and the whale's diving behavior precluded standard methods. The algorithm is especially useful where a transmitter location program exists; it determines the classical keplarian elements from the ARGOS spacecraft position vectors included with the probationary file messages. A minimum of three distinct messages are required. Once the spacecraft orbit is determined, the whale is located using standard least squares regression techniques. Experience suggests that in instances where circumstances inherent in the experiment yield message data unsuitable for the standard ARGOS reduction, (message data may be too sparse, span an insufficient period, or include variable-length messages). System ARGOS can still provide much valuable location information if the user is willing to accept the increased location uncertainties. Author (ESA)

N85-24421# Oregon State Univ., Newport. Marine Science Center.
THE ARGOS SYSTEM USED FOR TRACKING GRAY WHALES **c48**
Bruce R. Mate *In* CNES Data Collection and Platform Location by Satellite 1984 6 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

The development of satellite whale tags used to track gray whales in the eastern north Pacific Ocean is summarized. Two gray whales were radio-tagged in San Ignacio Lagoon (Mexico) and tracked on their northbound migration. One of the transmitters was modified to record and relay depth-of-dive information at 15 sec intervals throughout the course of the dive. Technical elements of data acquisition and analysis are outlined. The major biological findings are discussed. Author (ESA)

N85-24422# National Data Buoy Center, Bay Saint Louis, Miss.
AN OVERVIEW OF NDBC DRIFTING BUOY DEVELOPMENT PROGRAMS **c48**
Ron Kozak and John Anderson (Polar Research Laboratory, Inc.) *In* CNES Data Collection and Platform Location by Satellite 1984 11 p ARGOS Users' Conf., 21-23 May 1984 1984 11 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

Three drifting buoy development programs are described. The first is a drifter capable of measuring subsurface water temperature to a depth of 600 m using a multiplexer network which allows for increased reliability and reduced thermistor cable size and weight. This system uses ARGOS data for the reporting of diagnostic information to identify failure modes. The second program is the development of an operational sensor system for obtaining reliable wind direction measurements from drifting buoys. The third program addresses the design and development of a drifting buoy used to obtain hurricane information prior to landfall. Author (ESA)

N85-24423# National Data Buoy Center, Bay Saint Louis, Miss.
TACTICAL DEPLOYMENT OF SATELLITE-REPORTING DRIFTING DATA BUOYS FOR ENVIRONMENTAL DATA ACQUISITION
R. M. Partridge and J. J. Shimkus (Weather Reconnaissance Squadron (815th), Kessler, Miss.) *In* CNES Data Collection and Platform Location by Satellite 1984 16 p ARGOS Users' Conf., 21-23 May 1984 1984 16 p refs (For primary document see N85-24409 14-47)
Avail: NTIS HC A14/MF A01

Drifting buoys were deployed from various aircraft and surface vessels into remote, data-sparse regions from altitudes up to 20,000 ft. Surface weather, oceanographic, and other tactically applicable data can be obtained operationally from data buoys and routed by satellite communication to on-scene commanders and battle planners. Weather reconnaissance WC130 aircraft, using augmented load master crew members, can respond tactically for airborne reconnaissance as well as serve as a deployment platform for drifting buoys. Use of drifting buoy data to support emergency or routine operation is discussed. Author (ESA)

N85-24424# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES Abstracts Only
13 Mar. 1985 97 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-85-004) Avail: NTIS HC A05/MF A01

News items, abstracts, and scientific reports on aspects of Earth sciences including terrestrial geophysics; Arctic and Antarctic research; atmospheric physics; oceanography; and meteorology are presented. For individual titles, see N85-24425 through N85-24505.

N85-24425# Joint Publications Research Service, Arlington, Va.
MI-8 HELICOPTER CARGO LOADING EXPERIMENT FOR ARCTIC SHIPPING Abstract Only **c05**
S. Omelchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 3 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 18 Oct. 1984 p 4 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A cargo handling experiment in which the ocean-going ship Lakhta was loaded and unloaded with the aid of an MI-8 helicopter

is described. The ship was located in the Tatar Strait near Malaya Kema at the time. These operations were carried out by civilian helicopter pilots of Vladivostok, with the participation of specialists of the Far East Marine Shipping Line and the Maritime Territory Timber Procurement Association. The experiment was performed in connection with work which specialists of the shipping line are doing on the problem of loading and unloading vessels at shore points without cargo handling equipment and in conditions of drifting ice in the Arctic, and in areas without convenient sea inlets, ports and mooring places. The experiment consisted of two parts: helicopter-aided unloading of fuel and lubricants, and loading of timber. A number of proposals are made for correcting shortcomings of cargo-handling devices that were used in these operations. B.G.

N85-24426# Joint Publications Research Service, Arlington, Va.
PLANS FOR ADAPTATION RESEARCH DURING ANTARCTIC EXPEDITION Abstract Only c52
A. Mkhitaryan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 4 Transl. into ENGLISH from Sotsialisticheskaya Ind. (USSR), 31 Oct. 1984 p 4 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The human adaptation, working fitness forecasting in conditions of high elevations, and human physiological reserves in extreme conditions were studied. The effectiveness of conditioning to endure the oxygen-deficient conditions of Vostok station, located 4,000 meters above sea levels, was tested. Adaptogens based on natural products such as ginseng root, whose effectiveness in increasing resistance to oxygen deficiency will be evaluated. B.G.

N85-24427# Joint Publications Research Service, Arlington, Va.
RESULTS OF COMPARISON OF LONG-WAVE RADIATION FLUXES MEASURED BY SOVIET AND JAPANESE ACTINOMETRIC RADIOSOUNDS Abstract Only c46
M. I. Dolgin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 575-580 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Actinometric radio soundings of the atmosphere were performed between 1966 and 1971 at Antarctic stations of the USSR and Japan. The coordinates of the stations are 67 deg 40 min. S, 45 deg 50 min. E and 69 deg 00 min. S, 39 deg 35 min. E for the Soviet and Japanese stations. Both stations are in the same climatic region of the Antarctic coast, separated by about 300 km. Cases of simultaneous soundings at both stations, time difference not over 4 hours, during clear skies or complete cloud cover were examined to compare the long-wave radiation measurement values: 22 cases, 11 each clear sky and cloud cover, were involved. Significant differences are found in the measurement results, for which no satisfactory explanation exists. The measurements performed at the Japanese station agree better with predicted values. Author

N85-24428# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF ATMOSPHERIC AEROSOL FOR EVALUATION OF ITS EFFECT ON CLIMATE Abstract Only c45
K. Y. Kondratyev and M. A. Prokofyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 7 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 339-348 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The major areas of active investigation of the climatic effects of aerosol are reported: development of realistic models of aerosol for climate sensitivity studies; comparison of existing models of radiation transfer considering aerosol effects; inclusion of parameterization of radiation transfer in an atmosphere containing aerosol in climatic models; and determination of types of global aerosol, necessary for modeling of climate. Constructive superposition of concentration-weighted or optical density-weighted characteristics of various fractions, considering the regional principles of the division of independent sources and generation mechanisms, is the most suitable approach for modeling the vertical structure of optical characteristics of aerosol at the present time. The basic types of aerosols considered in models at the present time are noted. Adequate detailing of atmospheric aerosol models is possible only by utilization of the results of numerical experiments on the sensitivity of climate to aerosol parameters. Author

N85-24429# Joint Publications Research Service, Arlington, Va.
LYAPUNOV STABILITY OF VERY SIMPLE STEADY SOLUTIONS OF PROGNOSTIC SYSTEMS Abstract Only c47
V. A. Gordin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 8 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 356-363 Original language document announced as A84-39191 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A class of axisymmetric stationary solutions with Liapunov stability for three two-dimensional hydrodynamic forecasting systems has been found with the help of a variational method. The class of equations is considered as a functional phase space in which there exists a region around the stationary solution such that trajectories of a system with initial data from this region will always remain in it. Solutions for the class of equations are obtained numerically by solving two or three ordinary differential equations, and they can be used for testing other numerical schemes. I.H. (IAA)

N85-24430# Joint Publications Research Service, Arlington, Va.
POSSIBLE MULTIPLE ATMOSPHERIC THERMAL MODES WITH TIME SCALE ON ORDER OF ONE MONTH Abstract Only c47
V. K. Petukhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 8 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 456-468 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Certain natural atmospheric conditions with characteristic times much greater than the dynamic time, which is a few days. The presence of a minimum in the spectrum of major atmospheric variables such as temperature with a period of 15 to 20 days, comparable in depth with the mesometeorological minimum, allows processes with the new time scales to be distinguished. The model analyzes a spherical layer of the atmosphere over an underlying layer with properties symmetrical relative to the equator. Equal areas of ocean and continent (four in all) are assumed to alternate along each parallel, reproducing the global structure of the northern hemisphere. The physical properties of the continental and ocean surfaces are considered independent of coordinates except for a jump at the snow line or polar ice line. It is assumed that the time scale of the processes studied is significantly less than the scale of forced seasonal changes caused by the annual variation of insolation and properties of the underlying surface. Multiple stable quasi-steady thermal modes are observed when certain parameters are used. Author

N85-24431# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF INTERACTION BETWEEN OCEAN AND ATMOSPHERE ON INTENSITY OF MOVING TROPICAL CYCLONE Abstract Only c47
G. G. Sutyrin and A. P. Khain *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 9 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 787-794 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Results are presented from numerical experiments of the interaction of a tropical cyclone with the upper layer of the ocean for various speeds of movement of the cyclone and thicknesses of the mixing layer of the ocean. The calculations were performed with an axisymmetrical 12-level tropical cyclone model and an integral model of the upper layer of the ocean. Changes in the water surface temperature were considered in the model by the use of values obtained by averaging the temperature of the mixing

layer over the area of the ring around the eye of the storm. The experiments show a significant influence of negative feedback between the cyclone and the ocean on the intensity of the moving storm. As the speed of movement and initial thickness of mixing layer decrease, consideration of the interaction of the ocean and the atmosphere leads to greater weakening of the storm. Actual prediction of the behavior of a storm is impossible without accurate consideration of the interaction between the ocean and the atmosphere. B.G.

N85-24432# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TEMPERATURE AND DEGREE OF ROUGHNESS OF SEA AND LAND SURFACES BY MICROWAVE RADIOMETRIC POLARIZATION MEASUREMENTS Abstract Only **c48**
V. V. Bogorodskiy, A. I. Kozlov, and Y. K. Shestopalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 16 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 431-437 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Remote radiophysical methods are widely used to study natural surfaces, deriving information on temperature, dielectric constant and configuration of surfaces. The influence of roughness of both sea and land surfaces on the intensity of radiothermal radiation can be determined by polarization measurements which carry information on the roughness of surfaces. The roughness parameters a(2)=4 sigma(2)/l(2) and gamma(2)= 4 pi sigma(2)/l lambda square root of (1+2l/lambda)) are introduced, where sigma is the standard deviation of surface roughness, l is the spatial correlation radius of roughness and lambda is wavelength. A surface roughness criterion is introduced which is based on the integral influence of roughness on electromagnetic radiation. The problem of determining the temperature of the Earth's surface on the basis of polarization radiometric measurements is analyzed. Author

N85-24433# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF GRAVITY WAVE ENVELOPE SOLITONS ON SURFACE OF STRATIFIED FLUID INTERACTING WITH WIND Abstract Only **c46**
V. V. Petrov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 16 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 438-440 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Instability can generate nonlinear steady movements of a fluid in the form of an envelope soliton accompanied by a nonlinearly induced internal wave soliton. These waves are detailed considering the nonconservative nature of the medium and the wind effect. A shortened equation system is used from a previous work with the addition of terms describing dissipation and the wind effect. Numerical estimates of the parameters of the steady mode found are presented. Author

N85-24434# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELD OF CURRENTS AND ITS USE TO ESTIMATE TOTAL CONDUCTIVITY OF SEDIMENTARY DEPOSITS IN WESTERN BLACK SEA Abstract Only **c46**
S. M. Korotayev, S. V. Shabvelyanskiy, I. L. Trofimov, Y. M. Abramov, V. V. Kutkin, S. P. Gaydash, and L. M. Abramova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 17 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 86-94 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

In July to October of 1981, a combined geophysical expedition was sent to the Bulgarian shelf region and adjacent continental slope in order to study the deep structure of the sedimentary cover and basement. Electromagnetic measurements were undertaken to solve the problems of marine magnetotelluric soundings, magnetic variation profiling and magnetohydrodynamic profiling. Fields induced by currents in the sea were given particular attention both in the organization of measurements and in processing of data obtained. The electromagnetic field of the currents was measured over a broad range of time periods, from three hours to four days. The total longitudinal conductivities were determined by two methods, and the data coincide with measurements by several other methods and with seismic and gravimetric data on sediment thickness. The combination of deep marine magnetotelluric soundings with measurements of velocity variations will allow not only production of independent estimates of S, but also qualitative consideration of the interference introduced by the presence of currents. Author

N85-24435# Joint Publications Research Service, Arlington, Va.
ABSOLUTE MOVEMENT OF PACIFIC OCEAN PLATE BASED ON PALEOCLIMATIC AND PALEOMAGNETIC DATA AND TRAJECTORY OF HOT SPOTS DURING LAST 120 MILLION YEARS Abstract Only **c46**
M. V. Kononov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 17-18 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1442-1445 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Climatic zonality in the open ocean influences the nature of sediment accumulation. Analysis of materials from deep water drilling in the northwest Pacific and published information on the time when parts of the Pacific plate passed the equator were used to determine the positions of equatorial high productivity zones in the past. According to these data, 100 million years ago the central Pacific plate was 36 deg further south than at present. The mean rate of latitude drift of the plate has been 4 centimeters per year. Paleomagnetic poles indicate movement of the Pacific plate to the north by more than 5000 km over the past 120 million years. The most reliable paleomagnetic poles were selected by comparing paleomagnetic and paleoclimatic data, obtaining a trajectory of apparent migration of the paleomagnetic poles. A map is presented of movements of the North Pole relative to the Pacific plate, based on hot spot trajectories. The data obtained from these three independent sources unambiguously indicate movement of the Pacific plate over the past 120 million years by approximately 9000 km toward the northwest. B.G.

N85-24436# Joint Publications Research Service, Arlington, Va.
ONE PHYSICAL MECHANISM OF FORMATION OF FINE STRUCTURE OF OCEAN WATERS Abstract Only **c48**
A. M. Kudin and T. O. Abramyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 18 Transl. into ENGLISH from Dokl. Akad Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1464-1466 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Results from studies of the intrusion mechanism of formation of the fine structure of waters in the ocean are presented in universal form. Using expressions from a previous work for the propagation of the leading edge of an individual cylindrical intrusion L(t) and its maximum thickness h(t), the authors obtain m = 1/(nt)(1/3), where M = Ah/L; a = 0.48(ns/nu)(1/3), N is the Vaisala-Brunt frequency, S is the cross sectional area of the cylindrical spot which is constant in the viscous stage, hu is the kinematic viscosity of the fluid in the spot. Nineteen experiments in a tank measuring 50 x 375 x 190 mm and 6 experiments in a tank twice this size demonstrate the universality of the expression for density heterogeneities formed due to the interaction of cylindrical spots in a mixed fluid. Author

N85-24437# Joint Publications Research Service, Arlington, Va.
DYNAMIC STOCHASTIC MODEL OF LONG-PERIOD VARIABILITY OF OCEAN SURFACE TEMPERATURE Abstract Only **c48**
L. I. Piterberg and A. G. Ostrovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 19 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1467-1470 Original language document announced as A84-43933 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A correlation is established between a dynamic stochastic system of the revolutionary type and a multidimensional autoregression model of the first order. This approach provides a way to interpret physically statistical models of large scale geophysical processes and makes it possible to use estimates of autoregression parameters for calculating the unknown parameters of the equations. The approach proposed is applied to the analysis of the long term long period variability of the water surface in the North Atlantic, with the autoregression model based on Hasselmann's (1977) concepts of stochastic climate models. IAA

N85-24438# Joint Publications Research Service, Arlington, Va.
TWO-CYCLE MECHANISM OF DISSIPATION OF TIDAL ENERGY IN OCEAN Abstract Only c48
A. B. Rabinovich and G. V. Shevchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 19 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1470-1473 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Studies of recent years have shown that a special type of geostrophic movement, the continental shelf wave, is important in the formation of daily tides in the high latitudes. Estimates are presented of the dissipation of continental shelf waves in the example of the North Pacific Ocean. Studies have indicated that the shelf component of the tides should be intensively dissipated. It is found that in the high lattitudes a two cycle mechanism of tidal energy dissipation indicates for the daily tides: (1) transition of energy from large scale inertial gravitational waves to small scale geostrophic waves, converting a portion of the potential energy of tidal movements to kinetic energy; and (2) dissipation of the geostrophic shelf waves by bottom friction. Shelf waves dissipate a significant portion of tidal energy in this manner.
Author

N85-24439# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF BUBBLES FORMED UPON BREAKING OF WAVES ON GAS EXCHANGE BETWEEN OCEAN AND ATMOSPHERE Abstract Only c47
V. V. Alekseyev and A. O. Kokorin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 21-22 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 606-613 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A study was made of bubble gas exchange in storm zones in the ocean. A numerical model is presented allowing calculation of the gas flow from the bubbles into the water under various hydrodynamic conditions. Construction of a model requires the use of various parametric equations and simplifying assumptions. For this reason, a laboratory experiment was first performed, results of which were used to test the model, determine the limit of applicability of the assumption of proportionality of gas flow from a bubble to the area of its surface. It was found that the use of parametric equations leads to good agreement of the calculated flow and experimental data. The calculation indicated that at wind speeds of 12 to 16 m/s, the contribution of bubbles to gas exchange between the ocean and the atmosphere increases greatly. At very high wind speeds, 20 m/s or more, breaking of waves and introduction of large numbers of air bubbles into the upper layers of the ocean should lead to sharp decrease in the time required to establish identical concentrations of gases in the upper level of the ocean and the lower layer of the atmosphere.
Author

N85-24440# Joint Publications Research Service, Arlington, Va.
CONSIDERING ZONAL WIND IN SEMIDIURNAL TIDE PROBLEM Abstract Only c47
O. V. Kaydalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 22 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 907-914 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

An analysis of theoretical models of the semidiurnal atmospheric tides was conducted from the standpoint of correctness of consideration of the zonal wind. Results of numerical modeling of the semidiurnal tide using a numerical model of atmospheric oscillations are also dicussed. The analysis determines the degree of accuracy of consideration of zonal wind by the various models which are studied and yields practical recommendations for their application. The equation for averaging zonal wind in the modified theory of semidiurnal atmospheric tides is quite general, allowing correct application of the modified theory in the solution of other problems, while the criterion for application of the theory of disturbances for consideration of zonal wind is easily extended to any type of atmospheric oscillation such as internal gravity waves. The results of numerical modeling indicate that the zonal wind is not the basic cause of seasonal changes in atmospheric tide characteristics, and its short period variations cannot cause strong intraseasonal variability as is observed in the semidiurnal tide in the lower thermosphere.
Author

N85-24441# Joint Publications Research Service, Arlington, Va.
LOW-FREQUENCY OSCILLATIONS OF SEA LEVEL AND GROUP STRUCTURE OF WIND WAVES Abstract Only c48
V. V. Yefimov and Y. P. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 23 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 985-994 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

String type resistance wave measuring devices were used to measure low frequency sea level oscillations and group wind wave structures on a stationary installation in the Black Sea over 40 km from the nearest shoreline in an area with a smooth and level bottom and a mean depth of 30 m. The wavemeter signal was first passed through a low pass filter with a time constant of about 15 seconds, then sent to a recorder simultaneously with the unfiltered signal to allow synchronous recording of oscillations of surface level at the wind wave frequency and at lower frequencies. Wind velocity and direction at a height of 70 m were also continuously recorded. Estimates of spectral wind wave parameters based on five minute sequences of measurements differ significantly due to the group structure of the waves. Low frequency oscillations generated by groups of waves were observed in the wind wave field. The nature of the low frequency oscillations was physically related to the development of low frequency oscillations of current velocity in the surface layer. Velocity variations can be explained within the framework of a model of viscous nonpotential movement generated by wind waves. Author

N85-24442# Joint Publications Research Service, Arlington, Va.
ENERGY STRUCTURE OF ATMOSPHERIC BOUNDARY LAYER ABOVE WAVES Abstract Only c48
Y. G. Panchenko and D. V. Chalikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 24 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 834-841 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Movements in the atmospheric layer just above the water can be divided into three groups: quasihorizontal motions, wave motions created by the influence of the curved and moving surface of the water, and turbulent motions generated by the mean and wave elocity field. Formal derivation of energy equations for these three types of motion is undertaken in a tracking system of coordinates in which height is calculated from the moving surface. Equations for the evolution of kinetic energy of all three components are derived. The results of this study can serve as a basis for constructing a univariate differential model of the boundary layer above the surface of the waves. The specifics of the model yield a new variable, the energy of wave motions, for which a special equation must be constructed.
Author

N85-24443# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF COLD FILM IN WATER-AIR BOUNDARY LAYER Abstract Only c47

Y. P. Anisimova, Y. N. Belov, and A. A. Speranskaya *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 24-25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 848-853 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A study was made of the distribution of temperature in the water-air boundary layer with little temperature difference between the water and the air and with no adequate transfer. Experiments were performed under laboratory conditions on an installation consisting of a 25 liter plastic bath insulated on the bottom and sides by plastic foam 50 mm thick. The experiments show that when the water is much warmer than the air (15 to 20 C) all components of the thermal balance are directed from water to air. If the air temperature is a few degrees higher than the water temperature, the contact heat flux into the atmosphere may be greater than the heat loss of evaporation and effective radiation, and the heat flux into the water may be directed from the division boundary toward the lower layers of the water. A warm film is formed in this case on the water surface. In intermediate situations, with air and water temperature difference not over 1-1.5 C, cold films are present in the surface layer of the water and in a thin air layer near the water surface. Author

N85-24444# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY WIND WAVE SPECTRUM IN STORM BASIN Abstract Only **c48**
I. A. Leykin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 861-866 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Results are presented from measurements of the spectrum of developing wind waves in a circular aerohydrochannel under realistic conditions. The variation of the high-frequency (up to 10 Hz) portion of the spectrum as a function of wave formation conditions and long wave parameters is discussed. Measurements were performed in a storm basin. A circular channel 40 m in diameter with a rectangular cross section of 2 x 5 m, water depth 2.4 m using a nichrome resistance depth sensor with 1 mm resolution was employed. The frequency energy spectrum was calculated by computer with separate analysis of the low-frequency (0-2.5 Hz) and high-frequency (0-10 Hz) portions of the spectrum. The experimental data indicate absence of an equilibrium interval in the HF portion of the spectrum of wind waves. Author

N85-24445# Joint Publications Research Service, Arlington, Va.
FRONTAL NATURE OF CROMWELL CURRENT Abstract Only **c48**
V. T. Paka and K. N. Fedorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 26 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 725-731 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A study of kinematic and dynamic parameters indicates that the Cromwell Current, at least along a considerable part of its length, has a clearly expressed frontal nature. There is convergence of the meridional velocity component within the current, divergence in the layer adjacent to the surface and a considerable horizontal salinity gradient in a meridional direction in narrow zone extending along the equator within the current. The Cromwell Current is associated with the longest (and in position, most stable) subsurface salinity front in the ocean, this distinguishing it from the Lomonosov Current in the Atlantic Ocean and the Tareyev Current in the Pacific Ocean. This salinity gradient is what gives such a well-expressed frontal nature to the Cromwell Current and as a result the transequatorial transport is also transfrontal. As a result, the current has a highly unusual fine thermohaline structure of intrusional nature. An explanation is given for the unique nonisopycnic nature of the intrusional fine structure. All the reviewed data emphasize the frontal nature of the current and substantiate various significant structural differences between the Cromwell and Lomonosov Currents. Author

N85-24446# Joint Publications Research Service, Arlington, Va.
LOCAL MECHANISM OF EQUATORIAL COUNTERCURRENTS Abstract Only **c48**
E. N. Mikhaylova, S. K. Popov, and N. B. Shipiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 26-27 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 732-736 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Under the influence of a nonuniform wind a vertical velocity is excited at the lower boundary of the Ekman layer which changes sign with advance from the south to the north so that subsidence to the south of the zone of calms undergoes a transition into an upwelling of waters to the north of it. This results in a rising of the isopycnic line in a northerly direction and as a result of geostrophicity, the appearance of an easterly gradient current. It is shown that this gradient current is concentrated in a baroclinic layer, is quite intensive and is directed against the wind. This problem is examined in the following formulation. The wind currents are in a zonal channel of constant depth on the f-plane. The fluid is assumed to be continuously stratified. The linear theory of the main thermocline is used on the assumption that the sought-for functions do not change in the zonal direction. In this formulation a hypothesis is proposed explaining the reasons for the subsurface countercurrents observed to the south of the equator in the Pacific and Atlantic Oceans. Author

N85-24447# Joint Publications Research Service, Arlington, Va.
MODELING EVOLUTION OF UNSTABLE GEOSTROPIC EDDIES IN BAROTROPIC OCEAN Abstract Only **c48**
V. F. Kozlov and V. G. Makarov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 27 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 737-743 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

In the study of oceanic eddies the emphasis has been on those of a synoptic scale and little has been published on the behavior of structural eddy formations of lesser scales. The latter are legitimately studied in a quasigeostrophic approximation but the beta effect can be neglected. The contour dynamics method, which was developed for study of the behavior of regions with a constant vorticity, is particularly useful in studying these formations. This method has now been used in studying the evolution of regions of constant vorticity whose stationary configurations are unstable. This problem is examined in a barotropic model. This makes it possible to trace the evolution of eddy structures in the case of their loss of stability. All computations were made with fixed vorticity and a constant time interval in a Runge-Kutta scheme. Author

N85-24448# Joint Publications Research Service, Arlington, Va.
SOME APPROXIMATIONS OF GEOPHYSICAL HYDRODYNAMICS Abstract Only **c43**
A. L. Berestrov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 28 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 744-749 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The different approximations used in the hydrodynamics of a rotating stratified fluid for averaged movements are reviewed. The objective of the tudy was a more precise determination of the fields of applicability of these approximations. The basic characteristics of the quasistatic approximation are set forth, followed by a discussion of the Boussinesq approximation and the equation of the conservation of mass. Next the equation for the evolution of entropy is analyzed and it is shown that neither the equation for the conservation of mass nor the equation for the evolution of entropy as ordinarily written lead to the appearance of new types of waves among the solutions of the equations of geophysical hydrodynamics. It is shown further that retention of the time derivatives of density and pressure in the equations for the conservation of mass and entropy evolution respectively does not lead to the appearance of new types of waves and makes possible

a more precise description of processes transpiring in the entire thickness of the ocean or atmosphere. Author

N85-24449# Joint Publications Research Service, Arlington, Va.
REPRESENTATION OF TEMPERATURE AND SALINITY FIELDS USING STATISTICALLYT ORTHOGONAL FUNCTIONS (IN EXAMPLE OF POLYMODE DATA) Abstract Only c48
Y. B. Fliyushkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 28-29 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 756-763 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The method of expansion in statistically orthogonal functions (SOF) is applied to the random fields of temperature T and salinity S on the basis of archival materials and data from the POLYMODE experiment. The method and these data are used in computing systems of eigenfunctions of temperature salinity correlation matrices. These matrices were computed for 20 standard horizons from 0 to 1,100 m. The actual use of the sampled SOF requires a determination of their stability with transition from one sample to the next. It was found that stability of the eigenvectors of the temperature correlation matrix is retained from season to season, whereas the system has a lesser stability for the salinity correlation matrix. In order to exclude the influence of the upper layer of the ocean, which is subject to seasonal changes, systems of SOF were determined at 10 standard horizons from 250 to 1,100 m. As a result, the first three eigenvectors became more stable with transition from season to season. Seasonal changes exert virtually no influence on the temperature and salinity fields below 250 m and a unified system of SOF for such yields makes possible a considerable reduction of computations. Author

N85-24450# Joint Publications Research Service, Arlington, Va.
EVALUATING STRUCTURE-FORMING ROLE OF LATE PALEOZOIC AND MESOZOIC-CENOZOIC TECTONIC MOVEMENTS IN BALTIC SEA REGION Abstract Only c46
N. I. Sviridov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 30 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 794-800 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Recent research has indicated a need for reexamining points of view concerning the intensity of Late Paleozoic and Mesozoic-Cenozoic tectonic movements in the Baltic Sea region and their role in structure formation. Data from continuous seismic profiling and dredging, as well as other geological materials, made it possible to compile a schematic geological map of pre-Quaternary deposits, a map of plicative and disjunctive dislocations of the sedimentary cover and schematic seismological sections of the upper structural complex. There is no justification for judging the weakness of synchronous tectonic movements on the basis of the simple structure of the upper (Alpine) structural complext without allowance for the duration of development of structures and dislocations, thickness and absorbing properties of the sedimentary cover, especially since within the Baltic syneclise the upper structural complex nowhere lies directly on the basement. Author

N85-24451# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF MAGNETICALLY ACTIVE LAYERS OF INDIAN OCEAN DETERMINED FROM DEEP DRILLING DATA AND MAGNETIC SURVEYS Abstract Only c46
A. A. Shreyder *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 31 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 801-807 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

In the Indian Ocean the basalt basement has now been reached at 35 drilling points; magnetic properties were measured in the basalts of 24 of these holes. In the Indian Ocean the average penetration of a hole into the basaltic rocks was about 20 m. The age of the basalts determined by the K/Ar method can have an error + or - 10%. Among the Indian Ocean boreholes 12 were situated in regions of reliably identified paleomagnetic anomalies. The magnetic characteristics of the basalts in them and the parameters of models of the magnetically active layer as published in different sources are cited in a table. The remanent magnetization values prevailing in basalts from these holes were less by a factor of 2-10 than the values from model computations. Allowance for this finding in the modeling of paleomagnetic anomalies make it necessary to introduce a correction for the traditional parameters of the layer. Author

N85-24452# Joint Publications Research Service, Arlington, Va.
AUTOMATION OF RADIOMETRIC MEASUREMENTS IN NUCLEAR OCEANOLOGY Abstract Only c48
K. V. Grinberg, V. M. Kuptsov, V. A. Liskin, and L. S. Sitnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 31-32 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 843-848 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

An automated system for the collection and processing of data was developed applicable to instrument complexes for determining the absolute age of bottom sediments by the radiocarbon and lead (Pb-210) method. The system include an IEC interface which ensures the possibility of developing flexible systems with a great number of experimental devices. The system provides for data collection from 6 radiocarbon detectors and 2 low-background beta counters. The radiocarbon detectors are two-channel fluid scintillation counters. Measurements can be made at intervals of 1, 10, 100 and 1,000 sec. The system has been in laboratory use for three years, measurements being made around-the-clock, making it possible to obtain 40-45 radiocarbon datings per month. When determining the mean rate of sedimentation by the radiomeasured samples. As an example of use of this system the article gives the results of determination of the age of bottom sediments in the Baltic Sea. The system is simple in operation and highly reliable during prolonged measurements. Author

N85-24453# Joint Publications Research Service, Arlington, Va.
SMALL COMPONENT SPECTRAL MODEL OF ANNUAL COURSE OF ZONAL ATMOSPHERIC CIRCULATION Abstract Only c46
M. B. Galin and S. Y. Kirichkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 33 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 349-355 Original language document announced as 84A-39190 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A two-level spectral model of annual zonal atmospheric circulation is considered. The annual variation of insolation is parametrized in the form of the variation in the zonal temperature of radiative equilibrium. Partial overestimations of the variation are corrected by taking into account the time-dependent characteristics of global static stability. The model's simulation of the annual evolution of the jet stream, zonal temperature field, basic energy components, and energy conversion velocities is found to agree adequately with observed atmospheric conditions. I.H.

N85-24454# Joint Publications Research Service, Arlington, Va.
PARAMETERIZATION OF APPARENT AND LATENT HEAT FLUXES ABOVE WATER SURFACE IN CALM WEATHER UNDER NATURAL CONDITIONS Abstract Only c47
A. A. Grachev and G. N. Panin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 364-371 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A brief review is presented of the history of development of equations for calculation of apparent and latent heat transfer between air and water in calm weather. The conclusions drawn in two previous works by the authors are tested on the basis of experimental materials obtained under natural conditions and recommendations are presented for calculation of heat flux under light wind conditions. The theoretical equations suggested in the

previous works are found to describe the heat fluxes under near-calm conditions (wind speeds up to 3 m/s) quite well. Author

N85-24455# Joint Publications Research Service, Arlington, Va.
MEAN FREE PATH LENGHT OF PHOTONS WITH BROKEN CLOUD COVER Abstract Only **c47**
V. N. Skorinov and G. A. Titov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 372-378 Original language document announced as 84A-39392 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Mean path lengths and the distribution functions of photons along their paths are theoretically determined according to a statistical fit to a problem of radiation transfer in a cloud field with stochastic geometric structure. The broken cloudiness is characterized by clouds with horizontal sizes much greater than their vertical extent. The dependence of the mean path length on model parameters is determined numerically and the accuracy of the asymptotic method is estimated. It is found that the method permits measurements of mean photon path length which are accurate to within 3 to 5 percent. I.H.

N85-24456# Joint Publications Research Service, Arlington, Va.
CHEMICAL COMPOSITION OF COASTAL HAZE AEROSOL Abstract Only **c47**
Y. A. Pkhalagov and T. G. Cherkasova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 388-393 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Several series of studies of the chemical composition of coastal haze aerosols were performed during 1977-1981 in various areas of the Black Sea Crimean coast. Areas were studied in which the prevailing winds were both offshore and onshore. In the area with the sea breeze the concentration of all elements tested except NH(+) were higher (chloride ion, sulfate ion, hydrogen carbonate radical, nitrate radical, ammonium radical, sodium ion, potassium ion, calcium ion, magnesium ion, and pH). The elements which are the major components of sea salt varied widely in this area. Chlorine and sulfate ions represented over 60% of the total ions found. The concentration of nitrates was found to be independent of the type of air mass (continental or marine) as determined by prevailing wind direction. The difference in concentration of ions was found to be sufficient to allow identification of air masses in coastal areas. Author

N85-24457# Joint Publications Research Service, Arlington, Va.
ERROR IN LASER CORRELATION WIND SPEED METERS RESULTING FROM VARIABLE ATMOSPHERIC TRANSPARENCY Abstract Only **c47**
G. G. Matviyenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 440-443 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A theoretical estimate is presented of the error in correlation measurements caused by variable transparency of the atmosphere through which the laser beam propagates. A graph shows the variation in error of velocity measurement resulting from fluctuations in transparency as a function of optical properties of the atmosphere. The error due to the influence of atmospheric transparency is found to be negligible in relatively clear air up to 3-5 km. As atmospheric turbidity increases, error of this type becomes significant. Author

N85-24458# Joint Publications Research Service, Arlington, Va.
CONVECTIVE INSTABILITY OF HORIZONTAL LAYER OF BINARY MIXTURE Abstract Only **c46**
V. V. Kolesov, A. L. Urintsev, and V. I. Yudovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 36 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 444-446 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

It is assumed that a viscous heat conducting fluid containing an impurity fills an infinite flat horizontal layer. The lower boundary of the layer is a solid surface with a constant temperature. The free upper boundary is not deformed and has no shear stress. Above the layer is a nonmoving gas with quasi-steady temperature distribution. The heat flux through a vertical line in the atmosphere far from the free surface of the fluid is considered fixed. The temperature and normal component of heat flow are continuous upon transition through the free surface. The impurity does not flow through the boundary layer. The problem is to determine the velocity vector, pressure, temperature of the fluid, temperature of the atmosphere and concentration of the impurity in dimensionless form. Author

N85-24459# Joint Publications Research Service, Arlington, Va.
IONSPHERIC EFFECTS OF SEASONAL AND DIURNAL VARIATIONS OF ELECTRIC FIELDS IN EQUATORIAL F-REGION Abstract Only **c46**
N. M. Kashchenko and M. A. Nikitin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 36 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 393-397 Original language document annouced as 84A-40083 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Results are presented from numerical experiments intended to determine cyclical, seasonal and daily effects in the behavior of the equatorial F-region corresponding to cyclical, seasonal and daily variations in electric fields at low latitudes. An ionospheric model based on a single ion (O+) diffusion approximation considering the three dimensional nature of transfer of ionospheric plasma was used. The results of model calculations demonstrate that averaged data on daily variations of the longitudinal components in electric field intensity can be used to retrieve median NmF values with acceptable accuracy. It is found that in the equatorial ionosphere there is a strong correlation between the behavior of the F-region and variations in electric field intensity. The median variations in the longitudinal component of the electric field thus allow satisfactory determination of the mean dynamics and structure of the equatorial F-region. Author

N85-24460# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF INTERNAL GRAVITY WAVES ON F LAYER Abstract Only **c46**
G. G. Dudebulidze and A. D. Pataraya *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 37 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 398-402 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A nonlinear equation is derived for internal gravity waves in a three dimensional case and its approximate soliton solution is obtained. The solution of the equation for the distribution of electron concentration by altitude in the F layer is presented for the case near the maximum of electron concentration distribution when vertically moving disturbances consist of both linear and nonlinear waves. Author

N85-24461# Joint Publications Research Service, Arlington, Va.
UNIVERSAL TIME EFFECTS IN POLAR IONOSPHERE Abstract Only **c46**
N. M. Maksimova and N. K. Osipov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 37 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 403-406 Original language document announced as A84-40085 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Reference is made to earlier studies in which an analysis of the daily variance of f0F2 at antarctic stations has suggested the presence of UT control over the polar ionosphere. In particular, it has been shown that UT control produces a second maximum on

the f0F2 daily variance curves that is different in amplitude and in time of occurrence from the principal meridional maximum. In the study reported here, the effects of UT control over the variance of the spatial-temporal distribution of electron concentration in the polar ionosphere have been investigated by vertical sounding and incoherent scatterinbg, by direct satellite measurements, and by mathematical modeling. Experimental data are presented and compared with model predictions. V.L.

N85-24462# Joint Publications Research Service, Arlington, Va.
SPREADING OF GREATLY EXTENDED INHOMOGENEITIES IN UPPER IONSPHERE Abstract Only c46
N. S. Blaunshteyn and Y. Y. Tsedilina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 38 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 407-413 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Diffuse spreading of weak inhomogeneities in the ionosphere is studied. An approximate solution of the problem is used, according to which the distribution of concentration in the process of spreading of a quasi-neutral inhomogeneity in a weakly ionized plasma can be represented as the sum of two components, each of which can be determined by an ordinary diffusion equation in an anisotropic medium for electrons and ions diffusing at double velocity. New effects are detected which are characteristics for inhomogeneities greatly extended along the H axis. The influence of recombination on spreading of the inhomogeneity is found to be slight. The major contribution of recombination is observed at low altitudes and leads to a more rapid attenuation of the profile at altitudes below 120 km. The change in form of greatly extended inhomogeneities in the ionosphere, splitting of inhomogeneities into two, upward rise and extension into the magnetosphere observed are caused by inhomogeneity of the ionosphere throughout its height. An analysis of stages of relaxation of artificial inhomogeneities should therefore possibly include the influence of ionospheric inhomogeneity. Author

N85-24463# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF STRONG INHOMOGENEITIES IN IONOSPHERIC PLASMA, PART 1 Abstract Only c46
V. A. Rozhanskiy and L. D. Tsendin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 38-39 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 414-419 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Analytic solutions are presented for a number of univariate problems related to evolution of inhomogenities in the ionosphere. The physical cause of formation of sharply inhomogeneous concentration profiles similar to shock waves in gas dynamics is found. The total electric field is determined by the profile of phonon ion concentrations phonon ion concentration. At first, while N2 approximates N2(O), the intial N1 profile begins to move at a velocity bIPEO. An area of low N2 is formed at the leading edge. Particles from the low concentration area fill the initial profile, decreasing the electric field E in this area. Restructuring of the electric field within the initial profile occurs during the time of change delta phonon ion concentration =- delta phonon ion concentration approximates 1. The electric field at the leading edge increases to about AEO in this time and the depth of the low concentration area is about phonon ion concentration approximates A-1. During this same time a jump occurs at the leading edge. Subsequently, the N2 concentration in the initial profile increases, while E decreases, so that the loss time of the major quantity of injected ions is about aA/b1PEO. The maximum rate of loss in the initial stage is reached where A greater than a-1, then decreases with further increases in A. Author

N85-24464# Joint Publications Research Service, Arlington, Va.
ANISOPTROPY OF ALFVEN WAVE ABSORPTION IN IONOSPHERE Abstract Only c46
G. V. Givishvili, L. A. Lobachevskiy, M. V. Fiskina, and A. B. Shvartsburg *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 39 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 429-431 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A study is made of the propagation of long Alfven waves, radiated in the F layer at frequencies less than the ionic gyrofrequency, through the ionosphere. Absorption anisotropy increases greatly in the area where the collision frequency of electrons is less than their gyrofrequency while the reverse is true of ions. The refractive index of Alfven waves and the attenuation decrement in the direction of propagation are calculated. Calculation of low frequency absorption for the middle and low latitudes indicates the unique nature of absorption in this frequency range. The waves do not reach the Earth, being reflected at altitudes of about 140 km. The spectral distribution of the attenuation decrement contains a minimum, a transparency window in the plane of the magnetic meridian at 4 to 8 Hz. The anisotropy of wave attenuation has great decrements for propagation across the field. The altitude profile of the wave attenuation decrement indicates the existence of a maximum at 160 km, where the decrement is about 22. Author

N85-24465# Joint Publications Research Service, Arlington, Va.
ALTITUDE OF AURORAL SCATTERING OBSERVED ALONG AURORAL ELECTROJETS Abstract Only c46
Y. Y. Timofeyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 40 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 432-435 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The altitude behavior of radio auroras observed in the direction of electrojets for a single type of scattering-diffuse radio auroral layers (type DB) was analyzed. Radial auroral altitudes were measured by vertical interferometry. A statistical analysis of probability of appearance of various scattering altitudes is presented graphically. The altitudes average 10 km higher in the evening sector in the area of the easterly electrojet than in the westerly electrojet in the morning sector. The experimental results contradict the theory of convective loss of plasma waves responsible for the radio aurora. E.A.K.

N85-24466# Joint Publications Research Service, Arlington, Va.
CORRELATION OF RING CURRENT AND IONOSPHERIC GAP IN MORNING AND EVENING HOURS Abstract Only c46
A. S. Besprozvannaya, G. L. Gdalevich, V. D. Ozerov, E. N. Sosnovets, L. V. Tverskaya, and O. V. Khorosheva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 40-41 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 442-447 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Ring current protons and ion concentrations in the external ionosphere were measured by the Cosmos-900 satellite in circular orbit about 500 km in altitude, orbital inclination 83 deg, orbital period about 1.5 hours. It is found that in the evening sector the inner edge of the ring current coincides with the position of the plasmapause, so that ring current losses may be determined by processes of interaction between hot and cold plasma at the plasmapause. In the morning sector the inner edge of the ring current is not in the plasmapause, so that ring current losses cannot be related to processes developing at the plasmapause. They may be determined by processes of interaction between the ring current and the detached cold plasma which moves to the deeper L-shells in the process of drift under the influence of the westerly electric field. Structural changes in ionization during magnetically active periods, which may be related to the development of longitudinal currents are determined. Author

N85-24467# Joint Publications Research Service, Arlington, Va.
DISTURBANCES IN STRUCTURE OF LOWER IONOSPHERE AT TERMINATORS BASED ON RESULTS OF WINDE-BAND LW SOUNDING Abstract Only c46
G. F. Ignatyev and N. K. Osipov *In its* USSR Rept.: Earth Sci.

(JPRS-UES-85-004) 13 Mar. 1985 p 41 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 496-498 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Ionospheric disturbances which appear along the radio transmission path of a wideband noise-like signal when correlation reception is used were analyzed. Studies of these disturbances in the area of the terminators is of practical interest because the passage of the terminator through a radio transmission path may result in deterioration of communication conditions. Measurements were made in the 100-KHz band on radio paths in the middle latitudes of the Soviet Union, oriented from west to east. The Barker code was used to simulate the wideband noise-like signals. The correlation reception method for wideband LW signals as a diagnostic method in studies of the lower ionosphere is suggested. E.A.K.

N85-24468# Joint Publications Research Service, Arlington, Va.
FORESHORTENED SHORT-WAVE SCATTERING ON ARTIFICIAL IONOSPHERIC INHOMOGENEITIES Abstract Only c32
V. Y. Vovk, L. M. Yerkhimov, O. I. Maksimenko, E. Y. Mityakova, N. A. Mityakov, N. M. Voguta, B. Y. Nekrasov, V. P. Uryadov, A. V. Shirochkov, I. A. Shumilov et al *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 41-42 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 503-504 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Synchronous slant soundings of the ionosphere were performed in April, May and September of 1982 in the morning and evening hours. Reflections observed on the diagrams as a mode with a delay relative to the 1F2 mode were recorded only on the Murmansk-Kiev path, not the Leningrad-Kiev, Moscow-Kiev or Kheys island-Kiev paths. The observations of the foreshortening mode indicate that it develops when the heating frequency is 81 to 88% of the critical frequency of the F2 layer at the heated point. It is found that the slant sounding equipment is effective for the study of foreshortening scattering of radio waves on artificial ionospheric inhomogeneities created by powerful shortwave transmitters. Foreshortening modes are observed with a mean probability of 34.8% over the Murmansk-Kiev path at frequencies of 0.5-6 MHz. E.A.K.

N85-24469# Joint Publications Research Service, Arlington, Va.
MODELING OF SHEAR FLOW IN A STRATIFIED FLUID Abstract Only c34
A. M. Batchayev, V. A. Dovzhenko, and M. V. Kurganskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 42 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 451-455 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

An analog of a Kolmogorov flow in a stratified fluid and its stability was studied. Results are presented from the first experiments on laboratory modeling of a Kolmogorov flow in a stratified fluid. Modeling was performed by magnetohydrodynamic excitation of movement of an electrolyte in a rectangular vessel measuring 300 x 17 x 200 mm with the two side walls curved. A loss of stability in the area occupied by the flow clearly greater than 1. Local horizontal layers are generated with small eddies. An equation is derived which describes the experimental results for the Richardson number much greater than 1. E.A.K.

N85-24470# Joint Publications Research Service, Arlington, Va.
LONG NONLINEAR WAVES IN LAYERS OF SUDDEN CHANGES IN WIND VELOCITY Abstract Only c47
N. N. Romanova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 42-43 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 469-475 Original language document announced as 84A-42544 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

It is shown that long nonlinear waves on the boundary between two layers with abrupt variations in wind velocity and density in the lower layer can be described by the Korteweg-de Vries-Benjamin-Ono equation, in the case where the relative velocity of the layers and the internal wave phase velocity are close. It is also shown that long internal nonlinear waves in the two-layer fluid of constant density with a large wind velocity gradient in the lower layer can be described by the Benjamin-Ono equation. I.H. (IAA)

N85-24471# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL RESULTS OF TEMPERATURE-WIND SOUNDINGS OF THE ATMOSPHERE BY THE RADIO ACOUSTICAL METHOD Abstract Only c47
S. I. Babkin, Y. G. Proshkin, and Y. N. Ulyanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 43-44 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 495-500 Original language document announced as 84A-42546 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Methods and results are reported of synchronous measurements of air temperature, wind velocity and wind direction performed by a 10-cm radioacoustic sounding system and a high meteorological tower probe. Accuracy in the sounding measurements for the range from 20 to 200 m is found to be dependent on the wind velocity profile and wind shear measurements available for this region. The boundary values of the range of applicable measurements of the temperature-wind sounding system are calculated. It is concluded that the system has practical utility in gathering quantitative information from the atmospheric boundary layer. I.H. (IAA)

N85-24472# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TOTAL MOISTURE CONTENT IN CLOUD-FREE ATMOSPHERE BY RELATIVE RADIO EMISSION MEASUREMENTS Abstract Only c47
V. I. Aleshin, V. M. Piechkov, and T. Y. Barkan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 44 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 501-504 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A method to determing the total moisture content in the cloud-free atmosphere by relative measurement of atmospheric brightness temperature is suggested. In the method at three rather similar elevation angles for which atmospheric emission is isotropic with the antenna system used, the levels of proportional brightness temperature of the atmosphere are recorded. The relationship of differences of these levels and known surface temperature and moisture content are used to find the total atmospheric moisture content. A regression equation is derived relating the mean square measurement error to the error in determination of total water vapor mass in a column of the atmosphere. E.A.K.

N85-24473# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF ANISOTROPY OF SCATTERING OF RADAR SIGNALS BY CLOUDS AND PRECIPATION Abstract Only c32
N. N. Badulin, A. P. Batsula, Y. B. Kulsheneva, S. P. Lukyanov, Y. V. Masalov, and V. N. Tatarinov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 45 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 505-510 Original language document announced as 84A-42547 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The possibility of determining the geometric and electrophysical characteristics of hydrometeors is considered on the basis of estimates of anisotropy coefficient of radar signals scattered through clouds and precipitation. It is shown that the value of the anisotropy coefficient is extremely sensitive to changes of the phase state and shape of scatterers which in the case of hydrometeors is determined by their equivalent sizes. Experimental estimates of the anisotropy coefficient are presented for several

types of clouds and precipitatin, and an attempt is made to interpret the data obtained. I.H. (IAA)

N85-24474# Joint Publications Research Service, Arlington, Va.
DETERMINING ATMOSPHERE MOISTURE CONTENT FROM DIFFERENCES IN TWO-FREQUENCY MICROWAVE RADIATION MEASUREMENTS Abstract Only c32
V. A. Rassadovskiy and A. V. Troitskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 45-46 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 566-574 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Measurements of outgoing atmospheric radio radiation at the water vapor lien at 1.35 cm and in the 8 mm transparency window can yield reliable information on the integral moisture content and integral water reserves of clouds in the atmosphere above a water surface. A comparison is presented with the single-wave method. Results are presented from experimental determination of moisture content and reserves performed from an aircraft. Although the sensitivity of the difference signal to integral moisture content is three times lower than the single-frequency signal, the accuracy of radiometric measurements is improved and the influence of the underlying surface and cloud cover is significantly suppressed, allowing the accuracy of determination to be increased by a factor of 2 to 3, to about 5%. E.A.K.

N85-24475# Joint Publications Research Service, Arlington, Va.
STUDY OF INTEGRAL AND SPECTRAL DIRECT SOLAR RADIATION OVER ATLANTIC Abstract Only c46
Y. N. Leontyeva and I. N. Plakhina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 46 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 599-605 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Measurements were performed in July 1982 at 39 N, 209 W in the Atlantic Ocean to determine direct solar integral radiation S, and fluxes in three nonoverlapping spectral areas: S1(lambda < 0.525 micron), S3(0.38-0.7) micron) and S4(0.7-2.8 micron and S2(0.525-0.63 micron). Radiation fluxes were measured perpendicular to the line of sight to the sun with a standard thermoelectric actinometer. Results of the measurements are presented in tabular and graphic form. The transfer coefficient values characterizing the spectral composition of direct solar radiation are about 44 and 54% for photosynthetically active radiation and near-infrared areas. The variability of direct solar radiation above the mid-Atlantic was determined by variations in atmospheric aerosol composition over the ocean throughout the observation period. The mean tau a lambda 0 value was about 0.17, varying from 0.12 to 0.25. The direct incident solar radiation is approximately equally attenuated by the three major components (molecular scattering plus ozone, water vapor and aerosol). E.A.K.

N85-24476# Joint Publications Research Service, Arlington, Va.
MODELING OF RADIOTHERMAL RADIATION OF RAIN BY MONTE-CARLO METHOD Abstract Only c47
M. T. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 47 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 820-826 Original language document announced as 84A-13803 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The Monte-Carlo method was used to numerically simulate the microwave thermal emission of rain in a homogeneous isothermal layer, and in a plane-parallell rain slab. Estimates of polarization effects caused by scattering were made using Rayleigh and Mie phase matrices, and the results were included in the model. An analytical approximation of the layer emission intensity is obtained on the basis of a one-dimensional scattering model. The difference between results obtained using the two methods did not exceed 8 percent. I.H. (IAA)

N85-24477# Joint Publications Research Service, Arlington, Va.
APPLICABILITY OF VERTICALLY HOMOGENEOUS ATMOSPHERIC MODELS FOR REMOTE SOUNDINGS Abstract Only c46
S. K. Keevallik and A. G. Kheynlo *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 48 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 827-833 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

An attempt is made to clarify to what extent and under what actual conditions the approximation of a vertically homogeneous atmosphere can be used in studies of remote soundings. Three models of a plane-parallel cloudless atmosphere were used: the first was constructed on the basis of McClatchey tables giving the vertical distribution of molecular and aerosol scattering and absorption coefficients, using 30 layers - 1 km thick up to 25 km, 5 km thick up to 50 km. Models two and three were produced by simplification. Model two differs only in what a weighted mean value of aerosol scattering was used for the entire thickness. Modeel three is fully homogeneous through its height. Determination of the transfer function using only the known total optical thickness of the atmosphere is found to lead to serious errors. The homogeneous atmosphere approximation yields elevated values for the atmospheric transfer function above the sea. The degree of error differs for different parts of the spectrum. Author

N85-24478# Joint Publications Research Service, Arlington, Va.
SPECTROSCOPIC STUDY OF GAS POLLUTANTS IN ATMOSPHERE OVER LARGE CITIES: A REVIEW Abstract Only c45
V. I. Dianov-Klokov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 48-49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 883-900 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The spectroscopic method of determining the total content of gas impurity along a line of sight is based on the use of transparency spectra of the entire atmosphere. The intensity of lines or groups of absorption lines belonging to the component being studied is used to determine its total content along the line of sight. Practical spectroscopic studies of atmospheric pollution over cities in the USSR and Bulgaria, made by spectroscopic measurement of sunlight, have been primarily centered on carbon monoxide. The characteristic dimensions of the clouds of anthropogenic carbon monoxide above cities are estimated. It is found that the influence of the city of Moscow extends out to 2.5 to 3 times the radius of the city itself. The spectroscopic method using the sun as a light source has several advantages over direct sampling of the atmosphere: it requires less labor, is less expensive and allows sampling of the entire depth of the atmosphere at once, rather than sampling only of the gas near the surface. Author

N85-24479# Joint Publications Research Service, Arlington, Va.
COMPARISON OF OBSERVATIONS OF OROGRAPHIC DISTURBANCES IN THE TROPOSPHERE AND UPPER ATMOSPHERE Abstract Only c45
N. N. Pertsev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 901-906 Original language document 85A-15390 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The detection of standing and traveling waves is reported as the result of a spectral analysis of temperature measurements obtained aboard aircraft flying over the Ural ridge of the USSR. Physical parameters are estimated for a few specific examples of the standing wave packets. The principles of linear wave theory are used to show that such wave packets can cause orographic effects which are observable in the upper atmosphere. I.H. (IAA)

N85-24480# Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF CURRENT PULSATIONS OF CHARACTERISTICS IN ATMOSPHERE WITH PERIOD OF ABOUT 1.5 HOURS Abstract Only **c46**
S. V. Ferronskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 49-50 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 922-928 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Observational data were utilized to check for the existence of virial oscillations in the Earth's atmosphere with a period of about 1.5 hours, theoretically predicted in a previous work. The virial method of solving hydrodynamics problems considers the field of attraction of the matter involved. It consists of derivation from the equations of motion of a chain of moment equations, each of which describes the change in the corresponding moment of distribution of mass density in the system. Results are presented from spectral analysis of experimental recordings of air temperature made on a television transmitting tower. Spectal processing of recordings of variations in pressure are used to demonstrate the virial pulsations in the Earth's atmosphere with a period of 1.4 hours, observed in the middle latitudes of the Northern Hemisphere as well as the lower latitudes. The oscillations are coherent over long time intervals and are observed in both pressure and temperature in the lower layer of the atmosphere and at various points on the Earth during different seasons and years. Author

N85-24481# Joint Publications Research Service, Arlington, Va.
DIFFUSE REFLECTION OF LIGHT FROM TURBID CONSERVATIVE MEDIUM OF FINITE THICKNESS WITH INCIDENCE OF BEAM ON SURFACE OF SCATTERING GLANCING Abstract Only **c44**
A. I. Kuzovlev and V. S. Remizovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 50 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 929-938 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The process of low-angle reflection of light from a dense scattering medium of finite thickness is studied. Using the Boltzman transfer equation considering conditions at both boundaries of the scattering layer, a simple analytic expression is used for the angular spectrum of reflected radiation. The solution allows detailed study of the variation of the reflection process as a function of characteristics of the medium without using numerical methods. The solution can also be used as a test for numerical methods of computation of a broader range of problems from the theory of transfer at arbitrary angles of incidence. Analytic expressions are derived for the most probable and average reflection angles. The variation of these angles as functions of thickness of the medium, grazing indicence angle and scattering properties of the medium is studied. Author

N85-24482# Joint Publications Research Service, Arlington, Va.
VISIBILITY OF SMALL OBJECTS IN TURBID ATMOSPHERE Abstract Only **c74**
A. S. Drofa *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 51 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 939-946 Original language document announced as 85A-15395 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The problem of image transmission from self-luminous small-scale objects through a layer of aqueous polydisperse aerosol is considered theoretically. Based on a small-angle approximation solution to the radiative transfer equation, relationships are obtained which are used for estimating the distribution of light scattered near a diffusely luminous point source. The effect of aerosol-medium microstructure and its distribution along the line of sight on the parameters determining the visibility of small-scale objects in the atmosphere is studied from the perspective of linear sytem theory. Several formulas for estimating the visibility characteristics of small objects are derived. I.H. (IAA)

N85-24483# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AEROSOL ON FORMATION OF OUTGOING THERMAL RADIATION Abstract Only **c46**
Y. M. Timofeyev and S. P. Obraztzov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 51 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 947-956 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Results from the calculation of outgoing thermal radiation over a broad spectral range for standard aerosol models as well as a number of synthetic models with disturbances based on these standard models are analyzed. The aerosol is found to influence the brightness temperature by 0.1 to 0.4 K when the atmosphere is clear, up to 2 to 4 K for a turbid atmosphere. Aerosol scattering may contribute up to 5 to 10% to the outgoing thermal radiation at the top level of the terrestrial atmosphere. The use of the total aerosol attenuation coefficient for approximate consideration of the influence of the aerosol does not yield high accuracy in calculating the intensity of outgoing thermal radiation in the atmospheric transparency windows. The second parameter is therefore suggested, characterizing the degree of 'nonblackness' of the atmosphere. A specific expression is suggested for this parameter as a function of the attenuation factor, asymmetry paramter and albedo of single scattering, yielding a computational error of brightness temperature for the aerosol model of the clear atmosphere not over 0.1 to 0.2 K; for a turbid atmosphere - 0.4 to 0.6 K. Author

N85-24484# Joint Publications Research Service, Arlington, Va.
ONE-DIMENSIONAL NONSTATIONARY MODEL OF PHOTOCHEMICAL TRANSFORMATIONS OF GAS IMPURITIES IN STRATOSPHERE Abstract Only **c46**
I. L. Karol and A. A. Kiselev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 52 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 957-968 Original language document announced as 85A-15397 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The theoretical basis and parameters of a one-dimensional nonstationary model of trace gas photochemical transformation and vertical macroturbulent transport in the atmosphere up to 50 km are discussed. Seasonal vertical profiles of concentrations of atmospheric oxygen, nitrogen, hydrogen, and chlorine compounds are calculated. Model profiles are analyzed and compared with published values. Seasonal variations in vertical fluxes of the gases across 11, 25 and 35 km levels are also examined. I.H. (IAA)

N85-24485# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF POLARIZATION STRUCTURE OF REPEATED SCATTERING BACKGROUND IN OPTICAL LASER SOUNDING SIGNALS Abstract Only **c36**
G. M. Krekov and M. M. Krekova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 52-53 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 969-974 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The possibilities of polarization analysis in the interpretation of laser sounding signals are widely known. The Monte Carlo method has been developed as applicable to the solution of this class of problems. Calculations examples related to a mathematical model of a laser direction and ranging (ladar) device operating at 0.6943 microns, irradiating a cloud layer with a lower boundary at a known height above the ladar apparatus, are presented. It is found that the qualitative nature of depolarization of the multiply scattered background is related primarily to the microphysical nature of the medium, manifested in the behavior of the scattering matrix components, while quantitative changes in delta (tau) depend both on optical density and absorption capacity, as well as the geometric parameters of the ladar system. The qualitative specifics

of formation of the polarization structure of the ladar signal are correct only for a monosatic ladar system. Quantitative prediction of the characteristics of a signal in polarization soundings requires consideration of the boundary conditions which control the specifics of operation of each ladar device. Author

N85-24486# Joint Publications Research Service, Arlington, Va.
INTERPRETING REFRACTED WAVES METHOD DATA ON BASIS OF AUTOMATED DETERMINATION OF SEISMIC DRIFT Abstract Only **c46**
F. M. Lyakhovitskiy and S. A. Shapiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 59 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 36-45 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The OFSET program is outlined and examples of its application are given. Special features of the algorithm include automated determination of a number of statistical characeristics of travel-time curves for estimating seismic drift, separate analysis of relief and velocity characteristics of travel-time curves and conversion from an evaluation of the mean drift and the mean velocity for the entire profile to determination of integral drift and mean velocity values. It was found that the program is effective in constructing refracting boundaries of a complex form and discriminating velocity contacts. A combination of this method with an analysis of travel-time curves of the first arrivals and borehole observations should facilitate solution of such problems as determination of static corrections in surface sectors of high-velocity rocks, detection of underground voids, karst, ore bodies, buried peat bogs and the study of anisotropy of velocities. It is necessary that a sharp refracting boundary be present for use of the OFSET algorithm; the method is inapplicable for a strictly hemogeneous-layered medium with plane boundaries. Author

N85-24487# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELDS MIGRATION METHOD Abstract Only **c32**
M. S. Zhdanov and M. A. Frenkel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 60-61 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 60-74 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The properties of the reversed continuation of the electromagnetic field and the possibility of using electromagnetic migration for solving inverse problems in geoelectrics are examined. The following topics are discussed: integral Stratton-Chu formulas for nonstationary field; integrals of the Stratton-Chu type for a nonstationary field; reversed continuation of nonstationary electromagnetic fields; electromagnetic field migration; pseudo-migration fields; properties of electromagnetic migration; and migration of model electromagnetic fields. The theoretical and experimental materials given show that electromagnetic field migration can be used effectively in solving the geoelectric problem, making it possible to retrieve the geoelectric image of the medium. It is demonstrated that procedures involved in migration of the nonstationary electromagnetic field correctly conform to Tikhonov principles; the method is valid for nonstationary fields of both artificial and natural origin; and in pin-pointing a deep inhomogeneity and determining its configuration, it is necessary to have information only on the electromagnetic field observed at the Earth's surface and on the conductivity of a normal section. Author

N85-24488# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF DIRECTIONAL MAGNETOTELLURIC SOUNDINGS BY ANALYTICAL CONTINUATION METHOD Abstract Only **c32**
D. N. Chetayev, A. N. Osmakov, M. V. Matveichev, and A. K. Chernyshev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 61-62 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 75-82 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Directional magnetotelluric soundings constitute a natural development of the magnetotelluric method. A new mathematical model of the magnetotelluric field has been formulated which retains the Tikhonov assumption of the possibility of its description by a plane wave. Horizontal propagation is taken into account by the assumption that the wave can be nonuniform. The possibility of presence of partial waves of the electric field with a nonzero vertical component of the electric field E is allowed. The directional analysis of magnetotelluric observations was developed for determining the earlier unknown directions and phase velocity and spatial attenuation of horizontal propagation. The rejection of the earlier assumption of plane polarization of partial fields made it possible to examine any observed six-component quasimonochromatic field on an individual geomagnetic pulsation as a field on the surface of a horizontally layered half-space. A significant dependence of partial impedances on the characteristics of horizontal propagation of individual geomagnetic pulsations was discovered. B.W.

N85-24489# Joint Publications Research Service, Arlington, Va.
DETERMINING GEOMETRICAL DIVERGENCE USING SEISMIC OBSERVATION DATA Abstract Only **c46**
A. G. Averbukh and Y. A. Dyatlovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 63 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 90-93 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

In geometrical seismics the total geometrical divergence is used in characterizing the influence of changes in the area of the wave front on the amplitude of oscillations. An analytical solution of the problem of determining total geometrical divergence on the basis of seismic observation data is presented. The travel-time curves of the waves and the position of sources of oscillations are stipulated. In such a formulation the problem can be called the inverse problem of determination of geometrical divergence. A solution is found for a model representing an elastic layered half-space with an arbitrary configuration of the boundaries and distribution of sources but such that the principles of geometrical seismics are satisfied and the wave fronts do not have self-intersections. It is assumed that the point sources and receivers are situated on the horizontal surface of the half-space and from the times of wave registry it is necessary to determine the divergence value at some reception point j with excitation of oscillations at the point i. B.W.

N85-24490# Joint Publications Research Service, Arlington, Va.
NEW METHODS FOR INTERPRETING SEISMIC TIME FIELDS IN MEDIA WITH VARIABLE VELOCITIES Abstract Only **c46**
V. B. Piyp *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 65 Transl. into ENGLISH from Vestnik Moskovskogo Univ., Ser. 4: Geol. (USSR), no. 3, May-Jun. 1984 p 83-92 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A approach is suggested to the interpretation of kinematic wave fields, allowing solution of the problem of considering and determining both vertical and horizontal changes in velocity with various methods of seismic prospecting. Local approximation of a cross section by homogeneous functions can be used to interpret a system of travel-time curves consisting of several pairs of oppositely directed or overlapping curves. The method used is a follows. Each pair of oppositely directed curves is processed separately. The upper portion of the section is constructed by short pairs of curves and is reproduced in greatest detail, while the lower portion of the section is determined using long pairs of curves. The problems were checked using models and actual field materials. The methods and algorithms described here define a new approach to the solution of the inverse problems in geophysics. Author

N85-24491# Joint Publications Research Service, Arlington, Va.
MOST IMPORTANT GEOCHEMICAL BARRIER ZONES IN OCEAN (WITH EXAMPLE OF ATLANTIC OCEAN BASIN) Abstract Only **c48**
Y. M. Yemelyanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-

004) 13 Mar. 1985 p 66 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geograficheskaya (USSR), no. 3, May-Jun. 1984 p 39-53 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A list is presented of the major geochemical barrier zones plus a brief description of each one. The concept of the geochemical barrier refers to areas with a great decrease in intensity of migration of elements, resulting in a corresponding increase in concentration of elements. The barrier zone is thus a natural boundary, on opposite sides of which are different sedimentation conditions leading to sharp changes in the intensity of migration of certain associations of chemical elements. Both horizontal and vertical barrier zones exist. The significance of barrier zones in sedimento-genesis is variable. Among the horizontal zones the most significant are river-sea, shore-sea, second mechanical zone and divergence zone barriers. Of the vertical zones the most significant are the photosynthesis layer, thermocline, water-bottom layer and active layer. This work does not discuss the manifestation of the effects of biochemical and geochemical barrier zones under specific conditions. Author

N85-24492# Joint Publications Research Service, Arlington, Va.
DIAGRAM OF NONSTATIONARY REJOINING OF MAGNETIC FORCE LINES Abstract Only **c46**
V. S. Semenov, Y. P. Vasilyev, and A. I. Pudovkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 66-67 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 448-452 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A qualitative model of rejoining of magnetic lines of force is proposed which may be useful in the interpretation of explosive processes in plasma such as a magnetospheric substorm or solar flare. The term rejoining is used to refer to the Petschek mechanism of shock wave formation. The rejoining process is initiated in the current layer. The appearance of a current in the layer due to a sudden change in conductivity leads to the generation of MHD waves, particularly an Alfven wave, which creates the current flow system. The current layer is split and slow shock waves are formed. This results in spontaneous switching of magnetic force lines. The dimensions of the diffusion area and the occurrence of processes within it do not allow it to be considered in the magnetohydrodynamic approximation, requiring instead a kinetic approach. The approach is essentially phenomenological. The system is closed by considering the reverse influence of the convective zone on plasma processes in the diffusion area. The system suggested for the process is based on analysis of asymptotic, precise and numerical solutions from the literature. B.W.

N85-24493# Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATIONS IN TERRESTRIAL MAGNETIC FIELD AND STRUCTURE OF MAGNETOSPHERE Abstract Only **c46**
V. I. Afanasyeva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 67 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 460-466 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The purpose of this study is to show how the basic regularities of diurnal geomagnetic variations are related to the structure of the magnetosphere. A great deal of information on the structure of the magnetosphere can be obtained by comparing the mean characteristics of these S variations with known mean alues of magnetosphere parameters. The relationship of S sub Q variations to the structure of the magnetosphere is demonstrated by comparing the boundaries of changes in the signs of S sub Q variations and boundaries of structural elements of the magnetosphere and radiation belts. The latitude distribution of S sub Q variations is found to illustrate the change in shape of diurnal variations making up the geomagnetic field vector. The latitudes at which S sub Q = 0 differ for the various components. Analysis of these latitudes indicates that they coincide with or are at least close to structural magnetosphere boundaries. The results presented in this article confirm the relationship of the current system of S sub Q variations to processes occurring above the ionosphere up to the boundary of the magnetosphere. B.W.

N85-24494# Joint Publications Research Service, Arlington, Va.
EXCITATION OF GEOMAGNETIC Pcl-2 AND PULSATIONS WITH DECREASING PERIOD DURING MICROSUBSTORMS Abstract Only **c46**
Y. S. Barkova and S. I. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 68 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 467-471 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Materials recorded at a chain of stations extending along the auroral zone from Cape Schmidt to Lovozero observatory are used to study conditions of excitation of Pc1-2 pulsations and decreasing-period pulsations during microsubstorms in order to construct a more complete picture of the development of substorms. Simultaneously with the beginning of a microsubstorm in the noon-evening sector, ionocyclotron instability develops and as a result Pcl-2 pulsations are excited. The reason for the development of the instability may be the injection of protons into the area of the partial ring current directly in this sector or appearance of conditions favorable for development. At the moment of sharp activation of the microsubstorm, electric field directed to the west are developed or strengthened in a local area of the magnetosphere. The appearance of these fields in the area of development of instability leads to penetration of protons into the magnetosphere, and in turn to an increase in the frequency of radiation and period of Pc1-2 in the pulsations of decreasng period. B.W.

N85-24495# Joint Publications Research Service, Arlington, Va.
DIRECTIONAL ANALYSIS OF WAVE PACKETS OF MAGNETO-TELLURIC FIELD Abstract Only **c46**
M. G. Savin, Y. G. Izrailskiy, and R. A. Aplakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 68 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 472-475 Original language document announced as 84A-40097 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A new algorith is proposed for the directional analysis of magnetotelluric observations based on the determination of the dispersion of the wave packet as a whole. This approach makes possible a sufficiently reliable determination of the characteristics of the horizontal propagation of geomagnetic pulsations and of the specific resistance of the upper layer sigma by a variational method on the basis of an analysis of individual pulsations at single points. B.J. (IAA)

N85-24496# Joint Publications Research Service, Arlington, Va.
DYNAMIC SPECTRA OF MEAN MONTHLY VALUES OF GEOMAGNETIC FIELD ELEMENTS BASED ON SPECTRAL-TIME ANALYSIS DATA Abstract Only **c46**
V. N. Astapenko and Y. N. Kuznetsov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 69 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 476-481 Original language document announced as 84A-40098 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Usually when spectral-time analysis is used to determine the dynamic spectrum S(t,w) the initial time series F(t) is centered, a Fourier transform is applied, the spectrum obtained is multiplied by the frequency characteristic of a narrow-band filter, then a reverse Fourier transform is performed on the product. The modulus of the dynamic spectrum is primarily used in the stage of interpretation of the research results. Two methods for determining the dynamic spectrum in the frequency and time areas are discussed. A method suggested for determining dynamic spectra based on a moving window allows the fine spectral-time structure of the geomagnetic field to be studied. Author

N85-24497# Joint Publications Research Service, Arlington, Va.
LATERAL INHOMOGENEITY OF MANTLE SURFACE IN WESTERN EURASIA Abstract Only **c46**

N. Y. Kunin and E. R. Sheykh-Zade *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 69-70 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 21-34 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

An attempt is made to summarized data on the Mohorovicic discontinuity for the region including Europe and adjacent areas best studied by deep soundings. Areas are classified according to the type of data available. Specifically, subclass I-B consists of areas in which point profiling or recordings with long distances between observations on long profiles have been made using powerful explosions. The specifics of lateral changes in boundary velocities at the mangle surface in western Eurasia are described. In the Caspian Depression, deep seismic soundings have shown that the range of variation in the M discontinuity velocity is similar to that of young plates. There is a clear zonality in the lateral distribution of velocities: the eastern portion of the depression is one of high velocities, the central shows normal velocities while the western portion shows low velocities. External excition in an area of sharply differentiated mantle causes increased relative mobility of adjacent dissimilar blocks, resulting in intensive sedimentation within areas of relatively dense and high velocity lithosphere. B.W.

N85-24498# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF CRUST AND UPPER MANTLE DENSITY BASED ON DEEP SEISMIC SOUNDING AND GRAVIMETRY DATA, PART 1 Abstract Only **c46**
V. N. Strakhov and T. V. Romanyuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 71 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 44-63 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Due to the difficulty of practical combined interpretation of deep seismic sounding data and gravimetry data in three dimensions, this article analyzes a traditional two-dimensional statement of the problem. The method used can be extended to the three-dimensional case. This article is limited to logical analysis of the difficulties arising in combined interpretation of these two data types, assuming density to be a function of velocity, plus formation of the major methodological statements which must be used to support combined interpretation. A formalized mathematical statement of the problem is presented. The statement is regularized, considering the instability of solution of the inverse problem in gravimetry, and is suitable for automation. It is assumed that true, combined interpretation of deep seismic sounding and gravimetry data can be accomplished only on the basis of multiple version computation with the participation of an expert human interpreter. Author

N85-24499# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP BETWEEN SEISMIC STATUS OF EARTH AND RELATIVE POSITION OF BODIES IN SUN-EARTH-MOON SYSTEM Abstract Only **c46**
N. V. Kulanin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 71 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 95-99 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The time spectrum of variations in seismicity is quite broad. There are seismic seasons, as well as multiannual variations. The range of characteristic times of variation from days to about one year is studied. Seismic activity as a function of the position of the moon relative to the Earth and the direction toward the Sun is studied. The moments of strong earthquakes, over 5.8 on the Richter scale, between 1968 and June 1980 are plotted in time coordinates relating them to the relative positions of the three bodies in the sun-earth-moon system. Methods of mathematical statistics are applied to the points produced, indicating at least 99% probability that the distribution was not random. a periodicity of the earth's seismic state of 413 days is observed. Author

N85-24500# Joint Publications Research Service, Arlington, Va.
TEMPERATURE ANOMALIES ABOVE ORE BODIES Abstract Only **c43**
V. I. Gornyy and V. B. Yermolayev-Maslov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 73 Transl. into ENGLISH from Sov. Geol. (USSR), no. 6, Jun. 1984 p 113-119 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Temperature anomalies above ore bodies which can be revealed by aerial thermal surveys and field geothermal surveys are related to distortions of the quasisteady field of the Earth by ore bodies with heat conductivity differing from their surroundings, exothermal reactions related to oxidation of sulfide ores, and distortion of the variable heat field by objects with contrasting thermal properties. Geothermal measurements in boreholes at shallow depths are used to analyze the nature of changes in temperatures with depth at an ore deposit on the southern slope of the Caucausus. Temperature anomalies above ore bodies are found to be greatest at very shallow depths (about 1 meter). Variations in albedo above ore deposits result in nonuniform absorption of solar radiation with resulting temperature anomalies. Regular changes in the amplitudes of temperature anomalies with time and depth indicate that they are closely related to external variable heat sources. Author

N85-24501# Joint Publications Research Service, Arlington, Va.
STUDY OF EARTHQUAKE PREPARATION PROCESSES FROM DISTRIBUTION OF WEAK TREMOR EPICENTERS Abstract Only **c46**
B. G. Pustovitenko and A. G. Kamenobrodskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 74 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 44-52 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A method is described for determining regions where earthquakes represent a potential danger using information distributed in space and time in the area where the earthquake focus is prepared. Quantitative dependences were obtained between earthquake parameters and the preparation characteristics. The sensitivity of a characteristic is also considered. One of the characteristics of earthquake preparation is a change in the parameters of weak tremors in the area adjacent to the epicenter of a future major shock. Epicenters of weak earthquakes how a tendency to move away from, then gradually move toward the epicenter of the major (strong) tremor. The stronger the major tremor, the greater the distance by which the epicenters of weaker tremors move away from it and the greater the time between the maximum distance and the moment of the major tremor. Scanning of the history of an area to seek locations toward which the epicenters of series of minor tremors are tending is effective in predicting regions of earthquakes, but not exact locations and magnitudes. Author

N85-24502# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF REFLECTED WAVE RECORD FORM Abstract Only **c46**
Y. A. Galagan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 75 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 52-59 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

A method which utilizes the recorded form of reflected waves to determine the lithologic composition of the rock in a geological cross section is studied. The form of the record can be used to predict the material composition of an object only if the internal structure of the object exerts the predominant influence on its characteristics and the signal to noise ratio is at least 10 to 1. The specifics of formation of waves are studied for 7 thin layer models characteristic for terrigenous and carbonaceous sediment accumulation in order to clarify the relationship between the details of the recorded form and the structure of the reflected wave groups. Experimental materials are used to show that a stable solution of the inverse problem can be achieved by using methods

of pattern recognition to establish the information content of the various characteristics of reflected wave record forms. The method can be used to predict the structure and composition of objects in various geological situations. Author

N85-24503# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF RETRIEVING DYNAMICS OF REFLECTED WAVE METHOD RECORDS BENEATH LOW-VELOCITY ZONE Abstract Only **c46**
A. G. Madatov and A. M. Stovas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 75 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 59-71 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

Transformation of reflected wave method records beneath the base of the low velocity zone were studied using the theory of migration of wave fields or inverted wave continuations and allowing the boundaries of adequacy of the linear low velocity zone model to be determined in the space of its characteristics. The problem is reduced to one of reverse filtration. One significant difference of this reverse filtration from formal algorithms is that the desired output function is less defined. Principles of the theory of self organization of mathematical models can be applied. The result of this procesing is a continuation of the reflected wave records beneath the base of the low velocity zone, as well as refinement of the physical model of the zone itself, increasing the effectiveness of the method. Author

N85-24504# Joint Publications Research Service, Arlington, Va.
RESULTS OF STUDIES OF WAVE FIELD INTERNAL STRUCTURE IN PREDICTION OF GEOLOGICAL CROSS SECTION Abstract Only **c46**
G. F. Telepnev and V. P. Kovalev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 76-77 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 83-88 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The study of mechanisms of wave field formation using an object which has been drilled and seismically observed can be fruitful if the signal to noise ratio at the output of the seismic recording channel is maximized. An adequate mathematical model can be constructed using probabilistic deterministic theory. The most convenient model, considering both deterministic and statistical properties of the seismic signals, is the parametric linear prediction model with time variable parameters. Results from a profile in the southeastern portion of the Bogatoyskaya depression, where two prospecting boreholes are located show that the actual medium has thin strata, which is reflected in the seismic wave field. The wave field consists of the sum of elementary waves including mltiple waves formed at various levels of acoustical differentiation. The parameters of the elementary waves are determined by the physical characteristics of the cross section. A.R.H.

N85-24505# Joint Publications Research Service, Arlington, Va.
LOCATION OF CONTINENTAL PERMIAN VOLCANITES OF CENTRAL ASIA AND ITS TECTONIC INTERPRETATION Abstract Only **c46**
A. M. Kurchavov and V. V. yarmolyuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 83 Transl. into ENGLISH from Geotektonika (USSR), no. 4, Jul.-Aug. 1984 p 75-89 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

The general spatial distribution, structural position, and composition of Permian continental volcanic formations in central Asia are studied based on maps of the volcanites which also show late Carboniferous or early Triassic rock related to the Permian formations in the same series. Permian volcanites are found among places in the Balkhash area. In the central Kazakhstan volcanic zone, the Permian volcanogenic series is concentrated in the Tokrausk and Northeast Balkash areas. The series lies over Devonian deposits of Upper Carboniferous Lower Permian volcanites, differing from them in more alkaline composition of the rock. The youngest volcanogenic formations of eastern Kazakhstan are volcanites of the lower Triassic along the left bank of the Irtysh River near Semipalatinsk. This suite consists of basalts, trachybasalts and trachyandesites associated with trachyrhiolite varieties which predominate. In central Kazakhstan, Permian and Carboniferous volcanites are not found west of the system of fractures corresponding to the Karaganda-Balkhash west shore meridian. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-24506*# Department of Agriculture, Columbia, Mo.
SUPPLEMENT TO EVALUATION OF SATELLITE DERIVED ESTIMATES OF SOLAR RADIATION
Gary H. Sullivan, Vikki French, Sharon K. LeDuc, Jeanne L. Sebaugh, and Wendell W. Wilson Dec. 1984 97 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with NOAA, Columbia, Mo. and Missouri Univ., Columbia ERTS (Proj. AgRISTARS)
(E85-10086; NASA-CR-175521; YM-15-00405; JSC-20241; NAS 1.26:175521) Avail: NTIS HC A05/MF A01 CSCL 02C

Graphs and statistical tables are provided for each of the 23 stations which were analyzed in an effort to evaluate satellite derived estimates of solar radiation. A.R.H.

N85-24507*# Department of Agriculture, Columbia, Mo.
EVALUATION OF SATELLITE DERIVED ESTIMATES OF SOLAR RADIATION
Gary H. Sullivan, Vikki French, Sharon K. LeDuc, Jeanne L. Sebaugh, and Wendell W. Wilson Dec. 1984 50 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with NOAA, Columbia, Mo. and Missouri Univ., Columbia ERTS (Proj. AgRISTARS)
(E85-10087; NASA-CR-175522; YM-15-00404; JSC-20240; NAS 1.26:175522) Avail: NTIS HC A03/MF A01 CSCL 02C

The reliability of satellite derived estimates of daily insolation is analyzed for twenty-three ground truth observations in the United States over the period March through September 1983. A selection of graphic and statistical comparisons is generated for each location. Summarized results show the general level of reliability of these estimates. Author

N85-24508*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
ATLAS OF ARCHIVED VEGETATION, LAND-USE AND SEASONAL ALBEDO DATA SETS
Elaine Matthews Feb. 1985 55 p refs Submitted for publication
(NASA-TM-86199; NAS 1.15:86199) Avail: NTIS HC A04/MF A01 CSCL 08B

Global digital data bases of natural vegetation and land use were compiled, for use in climate studies, at 1 deg resolution from over 100 published sources. A series of 6 data sets, derived from the original compilations, was prepared and archived on tape at the National Center for Atmospheric Research (NCAR) (Matthews, 1984). The first is a vegetation data set representing natural (pre-agricultural) vegetation based on the UNESCO classification system. The second, derived from the land-use compilation, is a cultivation-intensity data set defining the areal extent of presently-cultivated land in the 1 deg cells. The last four are integrated surface-albedo data sets (January, April, July, October) for snow-free conditions, incorporating natural-vegetation and cultivation characteristics from the vegetation and cultivation-intensity data sets. Each of these data sets covers the entire surface of

the earth. They include non-zero data for permanent land only, including continental ice; water, including oceans and lakes, is zero. The present report includes maps, presented by continent, of the complete archived data, with the exception of Antarctica.
Author

N85-24509*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OBSERVATION MODEL AND PARAMETER PARTIALS FOR THE JPL VLBI PARAMETER ESTIMATION SOFTWARE MASTERFIT-F 2.0
J. L. Fanselow and O. J. Sovers 1 Feb. 1985 69 p refs
(Contract NAS7-918)
(NASA-CR-175640; JPL-Pub-83-39-Rev-1; ; NAS 1.26:175640) Avail: NTIS HC A04/MF A01 CSCL 08E

This report describes the model used in the parameter estimation software at the Caltech Jet Propulsion Laboratory (JPL) for the analysis of Very Long Baseline Interferometry (VLBI) data. The model components of geometry, clocks, the troposphere, and the ionosphere are covered.
Author

N85-24510*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
REMOTE SENSING OF DIRECTIONAL WAVE SPECTRA USING THE SURFACE CONTOUR RADAR
E. J. Walsh, D. W. Hancock, III, D. E. Hines, and J. E. Kenney (NRL) [1985] 4 p ref
(NASA-TM-84440; NAS 1.15:84440) Avail: NTIS HC A02/MF A01 CSCL 08B

A unique radio-oceanographic remote sensing instrument was developed. The 36 GHz airborne Surface Contour Radar (SCR) remotely produces a real-time topographical map of the sea surface beneath the aircraft. It can routinely produce ocean directional wave spectra with off-line data processing. The transmitter is a coherent dual-frequency device that uses pulse compression to compensate for the limited available power at Ka band. The radar has selectable pulse widths of 1, 2, 4, and 10 nanoseconds. The transmitting antenna is a 58 lambda horn fed dielectric lens whose axis is parallel to the longitudinal axis of the aircraft. It illuminates an elliptical mirror which is oriented 45 deg to the lens' longitudinal axis to deflect the beam towards the region beneath the aircraft. The mirror is oscillated in a sinusoidal fashion through mechanical linkages driven to a variable speed motor to scan the transmitter beam (1.2 deg X 1.2 deg) with + or - 16 deg of the perpendicular to the aircraft wings in the plane perpendicular to the aircraft flight direction.
B.W.

N85-24511# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
DIGITAL PROCESSING OF PASSIVE Ka-BAND MICROWAVE IMAGES FOR SEA-ICE CLASSIFICATION Final Report
D. T. Eppler, L. D. Farmer, A. W. Lohanick, and M. Hoover May 1984 62 p Original contains color illustrations
(AD-A150686; NORDA-51) Avail: NTIS HC A04/MF A01 CSCL 14/5

The primary objective of NORDA's Ka-band Radiometric Mapping System (KRMS) program is to provide basic research needed for Navy development of an operational imaging system that can produce detailed information concerning ice conditions over broad regions of the Arctic. To this end, methods suitable for automated identification and classification of sea ice types and open water are being developed. An experimental plan has been formulated that will lead to an automated system that will provide real-time ice classification information onboard Navy aircraft. This report represents completion of the initial state of this plan. During March 1983 extensive high-quality KRMS imagery and coincident high-resolution photography were obtained of ice in the Beaufort Sea. Analysis of these data suggests that four classes of winter surfaces can be distinguished solely on the basis on Ka-band brightness temperature: open water, frazil, old ice, and young/first year ice. New ice (excluding frazil) and nilas display brightness temperatures that overlap the range of temperatures characteristic of old ice and young/first year ice. Scenes in which new ice or nilas are present in appreciable amounts are subject to substantial errors in classification. Textural characteristics of nilas and new ice, however, differ significantly from textural features characteristic of other ice types and probably can be used with brightness temperature data to classify single-band microwave images.
GRA

N85-24512# Naval Postgraduate School, Monterey, Calif.
ESTABLISHMENT OF HYDROGRAPHIC SHORE CONTROL BY DOPPLER SATELLITE TECHNIQUES M.S. Thesis
D. H. Minkel Jun. 1984 159 p
(AD-A150709) Avail: NTIS HC A08/MF A01 CSCL 08/2

The methods of Doppler Satellite surveying, as applied to establishing hydrographic shore control, are presented and evaluated. Both methods, point and relative positioning, are defined procedurally with the advantages and disadvantages of each included. The field operations of two Doppler surveys (Monterey and Lake Superior) are reviewed with regard to requirements and procedures. A cost breakdown of the Lake Superior survey illustrates the high cost effectiveness of satellite techniques. The results of four Doppler data reduction programs (DOPPLR, MAGNET, GEODOP V, and MX 1502 translocation) are included and compared. Results of a special survey are included to demonstrate the high accuracy attainable by relative positioning methods. Selected data sets from both Doppler surveys were reduced using GEODOP V and are used to illustrate survey design and planning considerations. An accuracy standard for Doppler established shore control, compatible with both IHO and NOS accuracy standards is proposed. A method for determining station elevation differences is also presented.
GRA

N85-24513# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
MAP DESIGN FOR COMPUTER PROCESSING: LITERATURE REVIEW AND DMA PRODUCT CRITIQUE Final Report
G. Langran Jan. 1985 128 p Original contains color illustrations
(AD-A151061; NORDA-72) Avail: NTIS HC A07/MF A01 CSCL 08/2

A comprehensive review of DMA's standard map and chart products is necessary before DMA converts to digital production. Tradition was prevented product designs from evolving with changing technology. With digital production imminent, some current designs become prohibitively expensive because they rely on subjective or artistic decisions, or because they use nondiscrete processes unsuited to digital methods. To avoid extraordinary expense and delay in procurement, installation, and use of digital equipment, such designs should be replaced by graphic formats that are better suited to computer processing. This study identifies current DMA practices that will resist automation and suggests alternatives. Content and appearance of DMA products have been evaluated following a survey of available research literature. User requirements surveys, performance tests, and psychophysical studies have been applied to a critique of DMA's product line.
GRA

N85-24514# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Fernerkundung.
EVALUATION OF CARRYING CAPACITY AND LANDSCAPE DAMAGE IN NORTHERN KENYA BY MULTISTAGE REMOTE SENSING Ph.D. Thesis
Hc .nut Richard Goetting Sep. 1984 169 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-47; ISSN-0171-1342) Avail: NTIS HC A08 MF A01; DFVLR, Cologne DM 52,50

Geoecological studies were performed to determine the carrying capacity and the landscape damages in the arid areas of Northern Kenya using remote sensing methods. A combined method of aerial photomosaic and satellite data analysis was applied to achieve a planning base for systematic low altitude flight campaigns. Ground reference data to these remote sensing data were gathered twice, embracing ecological measurements and the registration of vegetation communities. The results are

analyzed by digital data and image processing. Data from LANDSAT are treated by digital image analysis methods, allowing to evaluate distribution patterns of vegetation communities. Author (ESA)

N85-24515# Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
NATIONWIDE URBAN RUNOFF PROJECT, CHAMPAIGN, ILLINOIS: THE BIOLOGICAL IMPACT OF URBAN RUNOFF ON THE SALINE BRANCH DRAINAGE DITCH AND BONEYARD CREEK Final Report
W. Blake-Coleman Sep. 1984 67 p refs
(PB85-150274; IEPA/WPC/84-028) Avail: NTIS CSCL 08H

Nationwide Urban Runoff Program (NURP) consisted of 28 projects which evaluated the type and extent of urban runoff problems, impacts of urban runoff on receiving waters and the effectiveness of control practices. The impacts of urban runoff on the receving stream were assessed. The effects of urban runoff on the biota of both the urban receiving stream were evaluated. Boneyard Creed, and the agricultural stream into which it flows, the Saline Branch Drainage Ditch, Fish and macroinvertebrate communities were sampled upstream and downstream from Champaign-Urbana area. Chlorophyll samples were collected upstream and downstream of the urban area. GRA

N85-23818*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ORBITING MULTI-BEAM MICROWAVE RADIOMETER FOR SOIL MOISTURE REMOTE SENSING
J. C. Shiue (NASA. Goddard Space Flight Center) and R. W. Lawrence *In its* Large Space Antenna Systems Technol., 1984 Apr. 1985 p 73-85 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 08H

N85-23820*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
LARGE SPACE ANTENNA TECHNOLOGY APPLIED TO RADAR-IMAGING, RAIN-RATE MEASUREMENTS, AND OCEAN WIND SENSING
R. K. Moore and S. P. Gogineni *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 97-108 refs (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 20N

N85-23881# Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Service Hydrologie.
THE ARGOS SYSTEM AND HYDROLOGY. RESULTS OBTAINED BY ORSTROM AND BENEFITS OF A DEGREE OF STANDARDIZATION
Jacques Callede *In* CNES Data Collection and Platform Location by Satellite 1980 7 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-24141# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING: NEW TOOL FOR CHINA'S GEOLOGISTS
Yang Guangqing *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 5-16 Transl. into ENGLISH from Zhongguo Dizhi (Peking), no. 1, 13 Jan. 1984 p 17, 18-23 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

N85-24184# Joint Publications Research Service, Arlington, Va.
GIGANTIC LITHIUM DEPOSIT DISCOVERED IN FRANCE
Jean-Francois Rouge *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 1-3 refs Transl. into ENGLISH from Liberation (Paris), 19 Feb. 1985 p 17 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

N85-24363# Compagnie pour l'Electronique, l'Informatique et les Systemes-Espace, Toulouse (France).
AUTOMATIC HYDROLOGICAL DATA COLLECTION FACILITY USING ARGOS
Bernard Fromantin *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 4 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24386# Electricite de France, Grenoble. Div. Technique Generale.
MEASUREMENT OF WATER EQUIVALENT OF MOUNTAIN SNOW COVER
P. Guillot *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 195-199 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24388# Swedish Meteorological and Hydrological Inst., Stockholm.
HYDROLOGICAL DATA COLLECTION FROM SWEDISH MOUNTAIN AREAS
Gunloeg Wennerberg *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 209-213 refs (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24389# Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
THE ARGOS SYSTEM AND HYDROLOGY: THE USE OF PLATFORM TERMINAL TRANSMITTER (PTT) WITH BUILT-IN MEMORY AND DIRECT RECEPTION BY THE SEINE BASIN HYDROLOGY SERVICE
J. Callede, J. Rentiere, and Y. Rouquerol *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 215-224 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24448# Joint Publications Research Service, Arlington, Va.
SOME APPROXIMATIONS OF GEOPHYSICAL HYDRODYNAMICS Abstract Only
A. L. Berestrov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 28 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 744-749 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24500# Joint Publications Research Service, Arlington, Va.
TEMPERATURE ANOMALIES ABOVE ORE BODIES Abstract Only
V. I. Gornyy and V. B. Yermolayev-Maslov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 73 Transl. into ENGLISH from Sov. Geol. (USSR), no. 6, Jun. 1984 p 113-119 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24779 Centre National d'Etudes Spatiales, Toulouse (France).
SCIENTIFIC EXPERIMENTS. PREPROCESSING OF SCIENTIFIC DATA [LES EXPERIENCES SCIENTIFIQUES. PRETRAITEMENT DES DONNEES SCIENTIFIQUES]
Michel Avignon *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 935-981 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-24516*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CHARACTERIZATION OF TERRESTRIAL SOLAR CELLS FOR SPACE APPLICATIONS: ELECTRICAL CHARACTERISTICS OF THIN WESTINGHOUSE DENDRITIC WEB CELLS AS A FUNCTION OF SOLAR INTENSITY, TEMPERATURE, AND INCIDENCE ANGLE

P. M. Stella and B. E. Anspaugh 15 Jan. 1985 71 p refs
(Contract NAS7-918)
(NASA-CR-175642; JPL-Pub-84-96; NAS 1.26:175642) Avail: NTIS HC A04/MF A01 CSCL 10A

Electrical characteristics of thin (100- and 140-micron) Westinghouse dendritic-web N/P silicon solar cells are presented in graphical and tabular format as a function of solar illumination intensity and temperature. Performance is also shown as a function of solar illumination angle of incidence for AMO. Author

N85-24517*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SPACEBORNE POWER SYSTEMS PREFERENCE ANALYSES. VOLUME 1: SUMMARY

J. H. Smith, A. Feinberg, and R. F. Miles, Jr. 15 Jan. 1985 25 p 2 Vol.
(Contract NAS7-918)
(NASA-CR-175644; JPL-Pub-85-5-Vol-1; NAS 1.26:175644) Avail: NTIS HC A02/MF A01 CSCL 10B

Sixteen alternative spaceborne nuclear power system concepts were ranked using multiattribute decision analysis to identify promising concepts for further technology development. Four groups interviewed were: safety, systems definition and design, technology assessment, and mission analysis. The ranking results were consistent from group and for different utility function models for individuals. E.A.K.

N85-24518*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SPACEBORNE POWER SYSTEMS PREFERENCE ANALYSES. VOLUME 2: DECISION ANALYSIS

J. H. Smith, A. Feinberg, and R. F. Miles, Jr. 15 Jan. 1985 160 p refs 2 Vol.
(Contract NAS7-918)
(NASA-CR-175645; JPL-Pub-85-5-Vol-2; NAS 1.26:175645) Avail: NTIS HC A08/MF A01 CSCL 10B

Sixteen alternative spaceborne nuclear power system concepts were ranked using multiattribute decision analysis. The purpose of the ranking was to identify promising concepts for further technology development and the issues associated with such development. Four groups were interviewed to obtain preference. The four groups were: safety, systems definition and design, technology assessment, and mission analysis. The highest ranked systems were the heat-pipe thermoelectric systems, heat-pipe Stirling, in-core thermionic, and liquid-metal thermoelectric systems. The next group contained the liquid-metal Stirling, heat-pipe Alkali Metal Thermoelectric Converter (AMTEC), heat-pipe Brayton, liquid-metal out-of-core thermionic, and heat-pipe Rankine systems. The least preferred systems were the liquid-metal AMTEC, heat-pipe thermophotovoltaic, liquid-metal Brayton and Rankine, and gas-cooled Brayton. The three nonheat-pipe technologies selected matched the top three nonheat-pipe systems ranked by this study. E.A.K.

N85-24519*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SENSITIVITIES OF PROJECTED 1990 PHOTOVOLTAIC SYSTEM COSTS TO MAJOR SYSTEM COST DRIVERS

L. W. Zimmerman and J. L. Smith 15 Dec. 1984 89 p refs
(Contract NAS7-918; JPL Proj. 5220-28; Contract DE-AI01-76ET-20356)
(NASA-CR-175669; JPL-PUBL-84-93; NAS 1.26:175669; DOE/ET-20356/20) Avail: NTIS HC A05/MF A01 CSCL 10A

The sensitivity of projected 1990 photovoltaic (PV) system costs to major system cost drivers was examined. It includes: (1) module costs and module efficiencies; (2) area related balance of system (BOS) costs; (3) inverter costs and efficiencies; and (4) module marketing and distribution markups and system integration fees. Recent PV system cost experiences and the high costs of electricity from the systems are reviewed. The 1990 system costs are projected for five classes of PV systems, including four ground mounted 5-MWp systems and one residential 5-kWp system. System cost projections are derived by first projecting costs and efficiencies for all subsystems and components. Sensitivity analyses reveal that reductions in module cost and engineering and system integration fees seem to have the greatest potential for contributing to system cost reduction. Although module cost is clearly the prime candidate for fruitful PV research and development activities, engineering and system integration fees seem to be more amenable to reduction through appropriate choice of system size and market strategy. Increases in inverter and module efficiency yield significant benefits, especially for systems with high area related costs. E.A.K.

N85-24520*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SILICON-SHEET AND THIN-FILM CELL AND MODULE TECHNOLOGY POTENTIAL: ISSUE STUDY

K. Shimada, E. N. Costogue, and R. R. Ferber 31 Dec. 1984 130 p refs
(Contract NAS7-918; JPL Proj. 5230-14; Contract DE-AI01-76ET-20356)
(NASA-CR-175654; JPL-PUBL-84-95; NAS 1.26:175654; DOE/ET-20356/21) Avail: NTIS HC A07/MF A01 CSCL 10A

The development of high-efficiency low-cost crystalline silicon ribbon and thin-film solar cells for the energy national photovoltaics program was examined. The findings of an issue study conducted are presented. The collected data identified the status of the technology, future research needs, and problems experienced. The potentials of present research activities to meet the Federal/industry long-term technical goal of achieving 15 cents per kilowatt-hour levelized PV energy cost are assessed. Recommendations for future research needs related to crystalline silicon ribbon and thin-film technologies for flat-plate collectors are also included. E.A.K.

N85-24521*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IN-VEHICLE EVALUATION OF THE GLOBE EV 2300 LEAD-ACID, DELCO REMY 150 NICKEL-ZINC, AND EAGLE-PICHER NIF 270 NICKEL-IRON BATTERY SYSTEMS

Aiji A. Uchiyama and James A. Bryant 31 Aug. 1984 147 p refs
(Contract NAS7-918; JPL Proj. 5030-570; Contract DE-AI01-78CS-54209)
(NASA-CR-175653; JPL-PUBL-84-51; NAS 1.26:175653; DOE/CS-54209/19) Avail: NTIS HC A07/MF A01 CSCL 10C

Developmental versions of the Delco-Remy nickel-zinc,the Globe lead-acid, and the Eagle-Picher nickel-iron battery systems designed for electric-vehicle application were evaluated. The systems were tested with the Jet Industries Jet 750 pickup truck and the General Electric/Chrysler ETV 1-2 vehicle on a a chassis dynamometer. Performance of the batteries were determined under: (1) constant-speed; (2) cyclic drive profiles; and (3) continuous and segmented driving conditions. Data are presented on capacity, specific energy, discharge, internal resistance, and temperature characteristics. Maintenance features, such as the single-point

watering and venting subsystems, and charging schemes, are addressed and results are discussed. E.A.K.

N85-24522*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT AND TESTING OF PARABOLIC DISH CONCENTRATOR NO. 1
E. W. Dennison and T. O. Thostesen 15 Dec. 1984 40 p
(Contract NAS7-918)
(NASA-CR-175651; JPL-Pub-85-4; DE-AM04-80AL-13137; NAS 1.26:175651) Avail: NTIS HC A03/MF A01 CSCL 10A

Parabolic Dish Concentrator No. 1 (PDC-1) is a 12-m-diameter prototype concentrator with low life-cycle costs for use with thermal-to-electric energy conversion devices. The concentrator assembly features panels made of a resin transfer molded balsa core/fiberglass sandwich with plastic reflective film as the reflective surface and a ribbed framework to hold the panels in place. The concentrator assembly tracks in azimuth and elevation on a base frame riding on a circular track. It is shown that the panels do not exhibit the proper parabolic contour. However, thermal gradients were discovered in the panels with daily temperature changes. The PDC-1 has sufficient optical quality to operate satisfactorily in a dish-electric system. The PDC-1 development provides the impetus for creating innovative optical testing methods and valuable information for use in designing and fabricating concentrators of future dish-electric systems. E.A.K.

N85-24523*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT OF AN ORGANIC RANKINE-CYCLE POWER MODULE FOR A SMALL COMMUNITY SOLAR THERMAL POWER EXPERIMENT
T. Kiceniuk 15 Jan. 1985 134 p refs
(Contract NAS7-918)
(NASA-CR-175650; JPL-Pub-85-3; DE-AM04-80AL-13137; NAS 1.26:175650) Avail: NTIS HC A07/MF A01 CSCL 10A

An organic Rankine-cycle (ORC) power module was developed for use in a multimodule solar power plant to be built and operated in a small community. Many successful components and subsystems, including the reciever, power conversion subsystem, energy transport subsystem, and control subsystem, were tested. Tests were performed on a complete power module using a test bed concentrator in place of the proposed concentrator. All major single-module program functional objectives were met and the multimodule operation presented no apparent problems. The hermetically sealed, self-contained, ORC power conversion unit subsequently successfully completed a 300-hour endurance run with no evidence of wear or operating problems. E.A.K.

N85-24524*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
TEST RESULTS OF AN ORGANIC RANKINE-CYCLE POWER MODULE FOR A SMALL COMMUNITY SOLAR THERMAL POWER EXPERIMENT
T. B. Clark 15 Jan. 1985 135 p refs Sponsored by NASA
(NASA-CR-175696; DOE/JPL-1060-83; JPL-9950-995; NAS 1.26:175696; SCSE-023) Avail: NTIS HC A07/MF A01 CSCL 10B

The organic Rankine-cycle (ORC) power conversion assembly was tested. Qualification testing of the electrical transport subsystem was also completed. Test objectives were to verify compatibility of all system elements with emphasis on control of the power conversion assembly, to evaluate the performance and efficiency of the components, and to validate operating procedures. After 34 hours of power generation under a wide range of conditions, the net module efficiency exceeded 18% after accounting for all parasitic losses. E.A.K.

N85-24525*# Midwest Research Inst., Golden, Colo. Sold State Research Branch.
SOLID/MELT INTERFACE STUDIES OF HIGH-SPEED SILICON SHEET GROWTH Quarterly Technical Progress Report, 15 Jul. - 15 Oct. 1983
T. F. Ciszek Feb. 1984 33 p refs Sponsored in part by NASA
(Contract DE-AC02-83CH-10093)
(NASA-CR-175698; DOE/JPL-W08746-83-1; NAS 1.26:175698; SERI/PR-212-2196; QTPR-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Radial growth-rate anisotropies and limiting growth forms of point nucleated, dislocation-free silicon sheets spreading horizontally on the free surface of a silicon melt have been measured for (100), (110), (111), and (112) sheet planes. Sixteen-millimeter movie photography was used to record the growth process. Analysis of the sheet edges has lead to predicted geometries for the tip shape of unidirectional, dislocation-free, horizontally growing sheets propagating in various directions within the above-mentioned planes. Similar techniques were used to study polycrystalline sheets and dendrite propagation. For dendrites, growth rates on the order of 2.5 m/min and growth rate anisotropies on the order of 25 were measured. Author

N85-24526*# Solavolt International, Phoenix, Ariz.
INTERMEDIATE LOAD MODULES FOR TEST AND EVALUATION Final Design Report
7 Sep. 1984 38 p Sponsored by NASA
(NASA-CR-175697; DOE/JPL-956349-01; JPL-9950-968; NAS 1.26:175697; DRL-186; DRD-SE-2) Avail: NTIS HC A03/MF A01 CSCL 10A

Photovoltaic modules were tested for qualification. Tests involved the following: (1) delivery of 20 solar cells for use as reference cells; (2) module documentation and inspection plans specifying the 10 Group I modules; (3) design review of module documentation from Group I modules; (4) revise module documentation to overcome any problems of deficiencies associated with the Group I modules; (5) delivery of 10 Group II modules built to revised specifications; (6) testing of Group II modules to the criteria as outlined in qualification specification. It is found that the solarvolt MSP43E40B satisfies the design criteria of qualification specification for intermediate load modules. Design changes were made in the Group I modules to overcome the deficiencies which allowed Group II modules to pass the qualification tests. E.A.K.

N85-24527*# Toronto Univ. (Ontario).
MODELLING OF PHOTODEGRADATION IN SOLAR CELL MODULES OF SUBSTRATE AND SUPERSTRATE DESIGN MADE WITH ETHYLENE-VINYL ACETATE AS POTTANT MATERIAL Annual Report
A. C. Somersall and J. E. Guillet 1983 71 p refs
(Contract NAS7-100)
(NASA-CR-175690; DOE/JPL-955591-84-11; JPL-9950-985; DRL-119; DRD-SE-5; NAS 1.26:175690) Avail: NTIS HC A04/MF A01 CSCL 10A

A computer model was developed which can generate realistic concentration versus time profiles of the chemical species formed during photooxidation of hydrocarbon polymers using as input data a set of elementary reactions with corresponding rate constants and initial conditions. The results of computer simulation have been shown to be consistent with the general experimental observations of the photooxidation of polyethylene exposed to sunlight at ambient temperatures. The useful lifetime (5% oxidation) of the unstabilized polyethylene is predicted to vary from a few months in hot weather (100 F) to almost two years in cool weather (45 F) with an apparent net activation energy of 10 kcal/mol. Modelling studies of alternate mechanisms for stabilization of clear, amorphous, linear polyethylene suggest that the optimum stabilizer would be a molecularly dispensed additive in very low concentration which can trap peroxy radicals and also decompose hydroperoxides. B.W.

N85-24528*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LASER-ASSISTED SOLAR CELL METALLIZATION PROCESSING Quarterly Report, 13 Jun. - 12 Sep. 1984
S. Dutta and P. A. Palaschak 30 Oct. 1984 30 p Sponsored by NASA
(NASA-CR-175686; DOE/JPL-956615-04; JPL-9950-986; NAS

1.26:175686) Avail: NTIS HC A03/MF A01 CSCL 10A

Laser assisted processing techniques for producing high quality solar cell metallization patterns were developed and characterized. A comprehensive literature search initially yielded information on state of the art laser assisted techniques for metal deposition such as laser chemical vapor deposition and laser photolysis of organometallics, as well as laser enhanced electroplating. A compact system for the laser assisted photolysis of gas phase compounds was designed and constructed. Initial experiments on laser enhanced electroplating yielded very promising results with linewidths as narrow as 25 micro m and local plating speeds as high as 12 micro m/s being achieved. Metal deposition experiments werre carried out utilizing laser assisted pyrolysis of a variety of metal bearing polymer films and metallo-organic inks spun onto silicon substrates. B.W.

N85-24529*# Spire Corp., Bedford, Mass.
EXCIMER LASER ANNEALING TO FABRICATE LOW COST SOLAR CELLS Quarterly Technical Report
Anton C. Greenwald Jan. 1985 31 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL 956797)
(NASA-CR-175702; DOE/JPL-956797-03; JPL-9950-1025; NAS 1.26:175702; DRL-214; DRD-SE-5; QR-10092-03; QTR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

The use of pulsed excimer laser annealing (PELA) of ion implanted junctions as a cost effective replacement for diffused junctions is the fabrication of crystalline silicon solar cells was examined. It is shown that the use of ion implantation and PELA to fabricate both the front junction and back surface field (BSF) is more expensive, per wafer, than a hypothetical baseline diffusion process. However, a cost advantage may be attained if the implant PELA process yields an improvement in the average cell efficiency from 14%, as assumed for the baseline diffusion process, to 16%. The development of an optimized PELA process compatible with commercial production, and increased cell efficiency with sufficient product for adequate statistical analysis are demonstrated. It is shown that a KrF based excimer laser can produce results equal to those seen with a XeCl laser. It is shown that the PELA junction can be improved by the time temperature cycles typically used to sinter screen printed contacts and that a PELA process with minimum overlap is preferred for both technical and economic reasons. E.A.K.

N85-24530*# ARCO Solar, Inc., Chatsworth, Calif.
PULSED EXCIMER LASER PROCESSING FOR COST-EFFECTIVE SOLAR CELLS Quarterly Report
D. Wong 1985 43 p ref Sponsored in part by DOE Prepared for JPL
(Contract JPL-956831)
(NASA-CR-175700; DOE/JPL-956831-3; JPL-9950-1035; NAS 1.26:175700; DRL-216; DRD-SE-3; QR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Residual lattice damage by 5 keV ion implantation and surface flaws induced by wafer cleaning are proven to affect the V sub oc more adversely for laser annealed cells than conventional thermal diffusion. However, an alternative, molecular implantation of molecular species holds potential. The first experimental results are encouraging. The lack of a commercially available mass analyzed implantation with low energy, high fluence ions is constraining. E.A.K.

N85-24531*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS AND EFFICIENCY STUDIES Quarterly Progress Report, 1 Oct. - 31 Dec. 1984
15 Feb. 1985 28 p ref Sponsored by NASA
(NASA-CR-175688; DOE/JPL-956312-10; JPL-9950-1036; NAS 1.26:175688) Avail: NTIS HC A03/MF A01 CSCL 10A

Optical and electrical characterization of defects has been started in EFG ribbon grown in a system that will be used to test the stress model. Temperature and stress field modeling aimed at defining low stress growth configuration is also in progress, and results will be used to guide development of the experimental system. The baseline defect configuration for ribbon grown at speeds of approx. 1 cm/min consists of dislocation densities of the order of 10 to the 5th power to 10 to the 6th power/sq cm, as well as saucer type etch pits and line defects. All these defects are inhomogeneously distributed. EBIC measurements indicate that diffusion lengths are in the range 20 to 60 microns, and significant spatial inhomogeneities occur through the ribbon thickness. Growth speed changes in the range 0.7-1.0 cm/min do not produce significant variations in ribbon defect configurations. Author

N85-24532*# Thermo Electron Engineering Corp., Waltham, Mass.
DEVELOPMENT OF ADVANCED THERMOELECTRIC MATERIALS Final Technical Progress Report
1984 57 p Prepared for JPL
(Contract JPL-954349)
(NASA-CR-175684; JPL-9950-1080; NAS 1.26:175684; TE380-53-84) Avail: NTIS HC A04/MF A01 CSCL 10A

The development of an advanced thermoelectric material for radioisotope thermoelectric generator (RTG) applications is reported. A number of materials were explored. The bulk of the effort, however, was devoted to improving silicon germanium alloys by the addition of gallium phosphide, the synthesis and evaluation of lanthanum chrome sulfide and the formulation of various mixtures of lanthanum sulfide and chrome sulfide. It is found that each of these materials exhibits promise as a thermoelectric material. E.A.K.

N85-24533# Varian Associates, Palo Alto, Calif.
ADVANCED HIGH-EFFICIENCY CONCENTRATOR CELL Final Report, 1 Apr. 1983 - 31 Mar. 1984
C. R. Lewis Oct. 1984 72 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000525; SERI/STR-211-2409) Avail: NTIS HC A04/MF A01

Novel ways of producing multijunction (cascade) solar cells with overall power conversion efficiencies of greater than or equal to 30% were investigated. Recent materials development work permits the individual cells of the cascade to be lattice-mismatched with respect to each other and to the substrate, increasing the number of potentially viable condidate component materials. The GaIn P proved to be not as desirable as either GaAs P or AlGaAs for the upper cell. Two junction cascade structures were pressed and are described. DOE

N85-24534# Institute of Gas Technology, Chicago, Ill.
ELECTRICITY PRODUCTION FROM COAL THROUGH MOLTEN-CARBONATE FUEL CELLS
Donald K. Fleming and John W. Colton (Beacon Corp.) 1984 6 p refs Presented at 19th Intersoc. Energy Conversion Eng. Conf., San Francisco, 19-24 Aug. 1984
(TI85-005072; CONF-840804-54) Avail: NTIS HC A02/MF A01

A project was undertaken to assess alternative systems for the production of electricity from coal using gasification and molten-carbonate fuel cells. The project objective was to identify R%D effort that might reduce the cost of power from such systems. The most cost-effective R%D effort identified is: (1) fluidized-bed gasification integrated with internally reforming fuel cells, (2) high-temperature dust removal, and (3) high-temperature fuel gas desulfurization. Other potentially promising R&D effort was also identified. Author

N85-24535# Colorado Univ., Boulder. Dept. of Chemistry.
SENSITIZATION AND QUENCHING IN THE CONVERSION OF LIGHT ENERGY INTO CHEMICAL ENERGY Final Report
Stanley J. Cristol 28 Dec. 1984 7 p
(Contract DE-AC02-79ER-10366)
(DE85-006301; DOE/ER-10366/5) Avail: NTIS HC A02/MF A01

A number of lifetimes of singlets were measured by a novel double-quenching technique and of triplets produced by photosensitization. A novel sensitization relay mechanism for energy transfer was discovered. A share of our effort was redirected to look at the factors involved in excitation (energy and electron) transfer within a molecule. The requirements for facile electron-transfer

are not yet defined. Rigid bridged polycyclic compounds were used as frameworks upon which to place light-accepting chromophores and reaction sites enabled construction of molecules in which initial tests of geometric, stereochemical and regio-chemical requirements for electron transfer, and other dimensional requirements. It is shown that intramolecular electron transfer is controlled by thermodynamic features, and by orbital features and geometry. Changes in substituents on aromatic light-absorbing chromosphores are observed and abilities of excited electrons to be transferred to remote sites, are compared with other modes of decay, depending upon the abilities of those sites to suffer reduction.
DOE

N85-24536# United Technologies Corp., South Windsor, Conn. Power Systems Div.
DEVELOPMENT OF MOLTEN CARBONATE FUEL CELL POWER PLANT TECHNOLOGY Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1984
C. L. Bushnell, C. L. Davis, J. E. Dayton, C. K. Johnson, M. Katz, M. Krasij, H. R. Kunz, D. L. Maricle, A. P. Meyer, and J. C. Pivar Sep. 1984 142 p
(Contract DE-AC21-79ET-15440)
(DE84-016839; DOE/ET-15440/19; FCR-6523; QTPR-19) Avail: NTIS HC A07/MF A01

A prototype molten carbonate fuel cell stack which meets the requirements of a 1990's-competitive, coal-fired electrical utility central station, or industrial cogeneration power plant was developed. Compressive creep testing of the present anode is continuedl the samples and support the earlier data showing improved creep resistance. Testing to define the operating limits that are suitable for extending the life of nickel oxide cathodes to an acceptable level is continuing. The mechanical characteristics of several one-piece cathode current collector candidates are measured for suitability. Metallographic evaluation of stack separators was initiated. Posttest characterization of surface treated INCO 825 was completed, retort corrosion testing of this material is continuing, potentiostatic immersion testing of alternative single piece cathode current collector materials is initiated. The 20-cell Stack No. 3 progressed from completion and delivery of the Test Plan through Design Review, assembly, and initial heat-up for the start of testing. Manufacture of separator plates for the upcoming 20-cell Stack No. 4 has begun. The primary objective of this follow-on test is stack cost reduction.
DOE

N85-23844*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY RESEARCH CENTER PHOTOGRAMMETRIC MEASUREMENTS OF SOLAR ARRAY DYNAMICS: PRELIMINARY RESULTS
M. Larry Brumfield, Richard S. Pappa, James B. Miller, and Richard R. Adams *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 577-545 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 10A

N85-23861*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR ARRAY EXPERIMENT (SAE) FLIGHT EXPERIENCE
Henry C. Hill, Leighton E. Young, and Gary F. Turner (Lockheed Missiles and Space Co., Sunnyvale, Calif.) *In* NASA. Langley Research Center Large Space Antenna systems Technol., 1984, Pt. 2 Apr. 1985 p 845-854 (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 10A

N85-24035# Joint Publications Research Service, Arlington, Va.
DROP OF COOLANT TEMPERATURE IN INDIVIDUAL COMPONENTS OF SOLAR HEATING SYSTEM Abstract Only
G. A. Abdullayev, R. R. Avezov, O. Azimov, and K. B. Khozhiyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 13 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 49-52 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24036# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE EVALUATION OF COST EFFECTIVENESS OF SOLAR ELECTRIC POWER PLANTS Abstract Only
D. Yu. Ibragimov and A. I. Filatov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 14 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 34-42 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24037# Joint Publications Research Service, Arlington, Va.
USE OF HEAT PIPES FOR HEAT COLLECTION AND TRANSMISSION IN SOLAR PLANTS Abstract Only
T. Z. Abidov, U. Kh. Gaziyev, and G. Ya. Umarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 14-15 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 27-29 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24038# Joint Publications Research Service, Arlington, Va.
POWER PLANTS OF MODULAR CONSTRUCTION WITH QUASI-PARABOLOIDAL CONCENTRATORS OF SOLAR ENERGY Abstract Only
V. K. Baranov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 15 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 17-22 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24091# Joint Publications Research Service, Arlington, Va.
SOLAR CELLS BASED ON POLYCRYSTALLINE SILICON WITH ISOTHERMAL POTENTIAL BARRIERS ALONG GRAIN BOUNDARIES Abstract Only
S. A. Azimov, F. A. Akhmedov, T. M. Kasymova, Z. Mirsaidova, and R. A. Muminov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 61 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 13-16 Original language document was announced in IAA as A83-48398 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24092# Joint Publications Research Service, Arlington, Va.
PHOTOVOLTAIC CELLS OF InP-CdS HETEROJUNCTION TYPE AND THEIR TEMPERATURE CHARACTERISTICS UNDER A-M ILLUMINATION Abstract Only
L. V. Gorchak, E. V. Gilan, V. G. Doroshenko, A. D. Kitoroaga, M. B. Kokhanyuk, Ye. V. Russu, and Ye. S. Khanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 61-62 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 10-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24093# Joint Publications Research Service, Arlington, Va.
SOLAR CELLS WITH DISTRIBUTED PARAMETERS: CURRENT-VOLTAGE CHARACTERISTICS UNDER UNIFORM AND NON-UNIFORM ILLUMINATION Abstract Only
Kh. K. Aripov and V. D. Rumyantsev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 62 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 6-10 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24094# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF PARAMETERS OF SILICON PHOTOVOLTAIC CELLS ON TEMPERATURE AND LIGHT INTENSITY Abstract Only
S. N. Borisov, S. M. Gorodetskiy, G. M. Grigoryeva, K. N. Zvyagina, and A. M. Kasymakhunova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 63 Transl. into ENGLISH from Geliotekh. (Tashkent), no. 4, Apr. 1983 p 3-6 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24127# Joint Publications Research Service, Arlington, Va.
SELECTIVE COATINGS FOR SOLAR-TO-THERMAL ENERGY CONVERTERS Abstract Only
G. A. Gukhman and M. M. Koltun *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 84 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 43-45 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24128# Joint Publications Research Service, Arlington, Va.
ERROR ANALYSIS OF HELIOSTAT ALIGNMENT METHODS Abstract Only
R. A. Zakhidov, A. Abdurakhmanov, Sh. I. Klychev, and V. M. Bogdasarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 85 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1983 p 22-26 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24481# Joint Publications Research Service, Arlington, Va.
DIFFUSE REFLECTION OF LIGHT FROM TURBID CONSERVATIVE MEDIUM OF FINITE THICKNESS WITH INCIDENCE OF BEAM ON SURFACE OF SCATTERING GLANCING Abstract Only
A. I. Kuzovlev and V. S. Remizovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 50 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 929-938 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-24537*# National Aeronautics and Space Administration, Washington, D. C.
DISTURBANCE TO THE POPULATION DUE TO FLIGHT OPERATIONS AT LANDING FIELDS. QUESTIONNAIRE ON COMMUNITY REACTION TO NON-COMMERCIAL AND SPORTING AVIATION
Bernd Rohrmann Feb. 1981 118 p refs Transl. into ENGLISH of the book "Die Gestoertheit des Bevoelkerung durch den Flugbetrieb auf Landeplaetzen. Eine Sozialpsychologische Feldstudie Durchgefuehrt im Auftrag des Bundesministeriums des Innern" Hamburg, Jul. 1975 p 1-108 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76531; NAS 1.15:76531) Avail: NTIS HC A06/MF A01 CSCL 13B

A field study was undertaken to determine the Sociopsychological effects of air traffic noise experienced by residents of areas near small sporting aviation fields. A questionaire was prepared which includes questions on flight restriction measures, on attitudes which moderate annoyance and on comparisons with other noise sources, etc. B.W.

N85-24538# Pacific Northwest Lab., Richland, Wash.
PLUVIUS: A GENERALIZED 1-DIMENSIONAL MODEL OF REACTIVE POLLUTANT BEHAVIOR, INCLUDING DRY DEPOSITION, PRECIPITATION FORMATION, AND WET REMOVAL, 2ND EDITION
R. C. Easter and J. M. Hales Nov. 1984 220 p refs
(Contract DE-AC06-76RL-01830)
(DE85-005542; PNL-4046-Ed-2) Avail: NTIS HC A10/MF A01

This report is a second edition user's manual for the PLUVIUS reactive storm model. The PLUVIUS code simulates the formation of storm systems of a variety of types, and characterizes the behavior of air pollutants as they flow through, react within, and are scavenged by the stores. The computer code supplied with this report is known as PLUVIUS MOD 5.0, and is a substantial improvement over the MOD 3.1 version given in the original user's manual. Example applications of MOD 5.0 are given in the report to facilitate rapid application of the code for a variety of specific uses. DOE

N85-24539# Pacific Northwest Lab., Richland, Wash.
MAP3S PRECIPITATION CHEMISTRY NETWORK Periodic Summary Report
Jane E. Rothert and M. Terry Dana Nov. 1984 351 p refs
(Contract DE-AC06-76RL-01830)
(DE85-005324; PNL-5198; PSR-7) Avail: NTIS HC A16/MF A01

Complete field and chemical data from the MAP3S precipitation chemistry Network for the year 1983 are summarized. Sections cover: QA/QC of the MAP3S/PCN; network history, network site information and a MAP3S/PCN bibliography; and a brief statistical look at the laboratory operations for 1983. A statistical summary for 1982 to 1983 is included. The Quality Control section includes the QA audits for site performance, laboratory comparisons, field blank and pH test results, and sample shipping and analysis results; and a listing of cooperating organizations and personnel for the MAP3S/PCN. DOE

N85-24540# Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologisch Onderzoek.
ADJUSTMENT OF THE NATIONAL DISPERSION MODEL FOR AIR POLLUTION FROM ELEVATED SOURCES [OVER DE AANPASSING VAN HET NATIONALE VERSPREIDINGSMODEL VAN LUCHTVERONTREINIGING VOOR HOGE BRONNEN]
A. A. M. Holtslag, F. T. M. Nieuwstadt, and M. P. Scheele Sep. 1984 31 p refs In DUTCH Sponsored by Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer
(KNMI-TR-57; B8477106; ISSN-0169-1708) Avail: NTIS HC A03/MF A01

The arguments for and against the adjustment of the different aspects of the Dutch air pollution dispersion model are discussed. Mixing layer height, calculation of plume rise, criteria for plume penetration into inversions, and the correlation between these aspects are treated. The dispersion coefficients which can be used in the Gaussian plume model are discussed. The effects of adjustments are illustrated with concentrations about an elevated point source. The advised method to calculate frequency distributions is presented. Author (ESA)

N85-24541# General Accounting Office, Washington, D. C. Resources Community and Economic Development Div.
ANALYSIS OF ISSUES CONCERNING ACID RAIN. REPORT TO THE CONGRESS
11 Dec. 1984 208 p
(PB85-149144; GAO/RCED-85-13; B-209020) Avail: NTIS HC A10/MF A01 CSCL 13B

Although science has largely determined that man made emissions cause acid rain, there is uncertainty concerning the extent and timing of its anticipated effects. Thus, at the present time scientific information alone does not lead unequivocally to a conclusion on whether it is appropriate to begin control actions now or to avail better understanding. Given this uncertainty, decisionmakers must weight the risks of further, potentially avoidable environmental damage against the risks of economic impacts from acid rain control actions which may ultimately prove to be unwarranted. The implications of current scientific knowledge for policy decisions on acid rain are examined. GRA

N85-23830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTREME PRECISION ANTENNA REFLECTOR STUDY RESULTS
G. R. Sharp, L. D. Gilger (Harris Corp., Melbourne, Fla.), and K. E. Ard (Harris Corp., Melbourne, Fla.) *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 279-300 ref (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-24428# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF ATMOSPHERIC AEROSOL FOR EVALUATION OF ITS EFFECT ON CLIMATE Abstract Only
K. Y. Kondratyev and M. A. Prokofyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 7 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 339-348 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24478# Joint Publications Research Service, Arlington, Va.
SPECTROSCOPIC STUDY OF GAS POLLUTANTS IN ATMOSPHERE OVER LARGE CITIES: A REVIEW Abstract Only
V. I. Dianov-Klokov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 48-49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 883-900 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24479# Joint Publications Research Service, Arlington, Va.
COMPARISON OF OBSERVATIONS OF OROGRAPHIC DISTURBANCES IN THE TROPOSPHERE AND UPPER ATMOSPHERE Abstract Only
N. N. Pertsev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 901-906 Original language document 85A-15390 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-24542*# Alaska Univ., Fairbanks. Geophysical Inst.
NUMBERICAL SIMULATION OF THE EFFECTS OF RADIALLY INJECTED BARIUM PLASMA IN THE IONOSPHERE
Daniel W. Swift 1 Apr. 1985 8 p refs
(Grant NAGw-269)
(NASA-CR-175638; NAS 1.26:175638) Avail: NTIS HC A02/MF A01 CSCL 04A

The morphology of the ion cloud in the radial shaped charge barium injection was studied. The shape of the ion cloud that remains after the explosive products and neutral barium clears away was examined. The ion cloud which has the configuration of a rimless wagon wheel is shown. The major features are the 2.5 km radius black hole in the center of the cloud, the surrounding ring of barium ion and the spokes of barium ionization radiating away from the center. The cloud shows no evolution after it emerges from the neutral debris and it is concluded that it is formed within 5 seconds of the event. A numerical model is used to calculate the motion of ions and electrons subject to the electrostatic and lorenz forces. E.A.K.

N85-24543*# Alabama Univ., Huntsville. School of Science.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Jan. - Mar. 1985
Richard H. Comfort and James L. Horwitz Jan. 1985 14 p refs
(Contract NAS8-33982)
(NASA-CR-175675; NAS 1.26:175675) Avail: NTIS HC A02/MF A01 CSCL 04A

Research and development in plasmas and magnetospheric environments is reported. Topics discussed include: analysis and techniques of software development; data analysis and modeling; spacecraft sheath effects; laboratory plasma flow studies; instrument development. E.A.K.

N85-24544# European Space Agency, Paris (France).
ACHIEVEMENTS OF THE INTERNATIONAL MAGNETOSPHERIC STUDY (IMS)
Bruce Battrick, comp and Erica Rolfe, comp. Sep. 1984 772 p refs Proc. of Intern. Symp., Graz, 26-28 Jun. 1984; sponsored by Scientific Committee on Solar-Terrestrial Physics and COSPAR Original contains color illustrations
(ESA-SP-217; ISSN-0379-6566) Avail: NTIS HC A99/MF E03

Investigations of auroral radiation; terrestrial nonthermal continuum radiation; magnetospheric electrostatic emissions; ELF-VLF wave observations in the ionosphere and magnetosphere; wave-particle interactions; plasma wave propagation; plasma parameters; and ground-based observations of the magnetosphere during the International Magnetospheric Study were discussed. The contributions of the GEOS and ISEE satellites, balloons, and sounding rockets were described. For individual titles, see N85-24545 through N85-24662.

N85-24545# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
RESULTS FROM THE GEOS-1 AND GEOS-2 SPACECRAFT AND THEIR CONTRIBUTIONS TO THE IMS
K. Knott *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Apr. 1964 p 9-23 refs Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The GEOS missions established the particle, wave and field environment at geostationary orbit based on observations by individual instruments. They studied dynamic processes in the magnetosphere based on data correlation with other IMS spacecraft. They advanced knowledge in basic plasma physics by carrying out direct observations of wave/particle interactions using correlations between individual GEOS instrument results. Observations permitted extensive studies of geomagnetic conjugate phenomena by comparing GEOS data with data from ground based observatories. The GEOS missions furthered understanding of the interaction of a spacecraft with its plasma environment and the ensuing charging of the spacecraft. Author (ESA)

N85-24546*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME CONTRIBUTIONS TO KNOWLEDGE OF THE MAGNETOSPHERIC PLASMA BY ISEE-1 INVESTIGATORS
K. W. Ogilve *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 25-38 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03 CSCL 08G

The ability to control the separation between ISEE-1 and 2 permitted study of the motion and structure of the bow shock and magnetopause, the boundary layers, and the plasma sheet. Evidence favoring the existence of reconnection and its relevance to the transfer of magnetic flux from the frontside to the rear of the magnetosphere, was obtained. The presence of reflected and accelerated particles is shown to lead to the development of a foreshock region between the bow shock and the interplanetary magnetic field line tangential to it. Precursors to interplanetary shocks are also observed. Inside the magnetosphere, ISEE contributed to knowledge of plasma waves, and, augmenting work with GEOS, to studies of plasma composition. In the near tail, the boundary layer of the plasma sheet disclosed interesting phenomena. Author (ESA)

N85-24547# Tohoku Univ., Sendai (Japan). Geophysical Inst.
OBSERVATIONS OF AURORAS AND RELATED PLASMA PHENOMENA BY THE KYOKKO AND JIKIKEN SATELLITE IN IMS
Hiroshi Oya *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Apr. 1964 p 39-48 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The Kyokko and Jikiken satellites were put into a semipolar and semiequatorial orbit, respectively, to study auroral physics. Contributions of the satellites include UV auroral images covering

from the dayside to nightside regions; survey of low energetic particle precipitations in the auroral zone, especially related to the inverted V events; high frequency resolution of auroral kilometric radiation (AKR) spectra indicating the movement of the acceleration region; discovery of the L-O and Z modes of AKR; confirmation of the plasma convection outside of the plasmapause; and shock-like movement of the plasmapause associated with the enhancement of auroras. The satellites also made contributions of the field of the radio propagation, and wave-particle interactions. Author (ESA)

N85-24548# Academy of Sciences (USSR), Moscow. Inst. of Space Research.

THE MEASUREMENTS OF PROGNOZ-4, -5, -6, -7 DURING IMS

A. A. Galeev *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 49-52 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

During the International Magnetospheric Study four Prognoz satellites equipped with instruments for measuring plasma and magnetic fields in the near-earth and interplanetary spaces as well as solar electromagnetic and corpuscular radiations were launched. The modes of plasma and field measurements on these satellites are described. Results on plasmasphere heating, ion composition of plasma mantle, and penetration of solar wind plasma into the magnetosphere are reviewed. Author (ESA)

N85-24549# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

THE EARTH'S MAGNETOPAUSE

Goetz Paschmann *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 53-64 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Achievements of the IMS study of the magnetopause are summarized. These include determination of the magnetopause thickness and motion; verification of the momentum gain by particles transmitted through (or reflected off) the magnetopause expected in the context of quasi-steady reconnection; determination of the tangential electric field and the amount of energy conversion implied by reconnection; discovery of dissipative signatures in terms of electron heat-flux layers; tracing of magnetic field line topology with energetic particles; direct identification of ionospheric particles in the boundary layer; discovery of a blobby structure of the low-latitude boundary layer; determination of the small electric potential contributed by the viscous boundary layer; and realization that reconnection frequently (if not dominantly) occurs impulsively and on small scales in flux transfer events. Author (ESA)

N85-24550*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.

THE STRUCTURE AND DYNAMICS OF THE MAGNETOSPHERE: PROGRESS IN THE IMS

C. T. Russell *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 67-76 refs (For primary document see N85-24544 14-46)

(Contract NAS5-25772)

Avail: NTIS HC A99/MF E03 CSCL 08G

Knowledge of the magnetosphere before the International Magnetospheric Study (IMS) is reviewed, and advances due to IMS are outlined. Post IMS studies are summarized. The GEOS spacecraft continuously monitored the state of the interior of the magnetosphere. The ISEE-1 and 2 satellites measured the velocities of magnetospheric boundaries. The ISEE-3 monitored solar wind input to the magnetosphere. The spacecraft provided data on magnetopause thickness, reconnection, electric field configuration, and plasma currents. Post IMS projects examined the ionosphere, auroras, and the deep geomagnetic tail. Author (ESA)

N85-24551*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

OBSERVATIONS OF THE MAGNETOSPHERIC BOUNDARY LAYERS

T. E. Eastman *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 77-83 refs (For primary document see N85-24544 14-46)

(Contract NAS5-26257; Grants NGL-16-001-002; NAG5-295; Contract N00014-76-C-0016)

Avail: NTIS HC A99/MF E03 CSCL 04A

Results on magnetospheric boundary layers are reviewed, emphasizing their dynamical importance based on hot plasma observations, energetic particle signatures, heavy ion contributions and the effects of wave-particle interactions. Satellite plasma observations show that 1% to 2% of the oncoming solar wind plasma enters the magnetosphere and is initially transported within the magnetospheric boundary layer. Some of this boundary layer plasma is entrained within the Earth's magnetotail where it can be accelerated. Tests are needed to determine the relative contributions of the primary acceleration processes whose effects are especially evident in the plasma sheet boundary layer. Author (ESA)

N85-24552# Los Alamos Scientific Lab., N. Mex.

HOT PLASMA AND ENERGETIC PARTICLES IN THE EARTH'S OUTER MAGNETOSPHERE: NEW UNDERSTANDINGS DURING THE IMS

D. N. Baker and T. A. Fritz *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 85-96 refs Sponsored by DOE (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Accomplishments during IMS in clarifying magnetospheric particle variations in the region from geostationary orbit altitudes into the deep magnetotail are reviewed. Acceleration processes, transport processes, and loss processes are discussed. Changes in hot plasmas and energetic particle populations related to geomagnetic storm and magnetospheric substorm effects are considered. The IMS data allow a unified view as magnetospheric particles are traced from their acceleration source through the plasma sheet and outer trapping regions to their loss via ionospheric precipitation and ring current formation processes. Author (ESA)

N85-24553# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.

ELECTRIC FIELD AND PLASMA OBSERVATIONS NEAR THE MAGNETOPAUSE AND BOW SHOCK DURING A RAPID COMPRESSION

K. H. Alfsen, C. Bonifazi, A. Pedersen, and P.-A. Lindqvist (Royal Inst. of Tech., Stockholm) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 99-104 refs Sponsored by ESA (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

A fast compressional motion of the magnetopause resulting from the interaction of an interplanetary shock and the Earth's magnetosphere is discussed. The ISEE-1 and 2 satellites were in the frontside magnetosphere before the shock. A magnetosonic wave front, the magnetopause, and the bow shock passed them in a very short time. By a combination of electric and magnetic field data it is possible to determine the magnetosonic and the magnetopause velocity, in good agreement with magnetic time delay measurements. It is possible to establish that during this compressional motion the E x B velocity was towards the magnetopause from both sides, 75 km/sec from the Earth side and 50 km/sec from the Sun side. A power conversion flux close to +400 W/sqKm was determined for the magnetopause. A sunward potential drop of 135 to 280 V was detected near the bow shock, with power conversion flux negative, and 10% of the solar wind kinetic energy flux. Author (ESA)

N85-24554# Moscow State Univ. (USSR). Inst. of Nuclear Physics.

THE > keV ELECTRONS AND > 80 kEV PROTONS IN THE VICINITY OF THE HIGH LATITUDE MAGNETOSPHERE AND AT THE BOW SHOCK

A. E. Antonova, O. R. Grigorian, and V. G. Stolpovsky *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 105-110 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

During the International Magnetospheric Sutdy, the Prognoz-7 satellite carried out regular measurements of the fluxes and spectra of energetic electrons and protons in the outer magnetosphere and in the magnetosheath for 8 months. The electron fluxes were measured in the > 10 keV and > 30 keV ranges, and the proton fluxes were observed differentially at 5 energy intervals within the 0.07 to 10 MeV range. A sharp increase of the energetic particle flux is observed in each passage through the magnetosheath near the magnetopause and through the bow shock. The proton spectrum at the magnetopause is shown to be harder than near the bow shock and to soften when moving deeper into the magnetosheath. Author (ESA)

N85-24555*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
MAGNETIC FIELD OBSERVATIONS AT THE DAYSIDE MAGNETOPAUSE: ISEE-1 AND -2 CONTRIBUTIONS DURING THE IMS
J. Berchem and C. T. Russell *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 111-115 refs (For primary document see N85-24544 14-46)
(Contract NAS5-25772)
Avail: NTIS HC A99/MF E03 CSCL 04A

Dayside magnetopause macroscopic characteristics such as velocities and thicknesses of the boundary and internal magnetic field structure of the current layer were studied by ISEE-1 and 2. The ISEE results suggest that the magnetopause is much thicker than previously thought. A current sheet thicker than several proton gyroradii rules out classical kinetic theories of a magnetopause current layer of the order of the ion gyroradius. Such a thick boundary may explain the failure of theories which predict a unique polarization for the field rotation inside the current sheet.
Author (ESA)

N85-24556# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
MAGNETIC FIELD IN THE EARTH'S OUTER MAGNETOSPHERE: PROGNOZ-6, -7 DATA
A. E. Antonova, E. G. Eroshenko (IZMIRAN, Troitsk, USSR), and V. A. Styazhkin (IZMIRAN, Troitsk, USSR) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 117-120 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The Prognoz-6, 7 measurements of magnetic field at 8 to 25 RE in the outer magnetosphere and in the adjacent regions carried out within the IMS program are presented. The experimental data are compared with magnetospheric model predictions.
Author (ESA)

N85-24557# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EFFICIENCY OF ELECTRIC FIELD TRANSFER AT EARTH'S MAGNETOPAUSE AND FLOW AMPLITUDES RELATED TO RECONNECTION
W. D. Gonzalez *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 121-123 refs (For primary document see N85-24544 14-46)
(Contract FINEP-537/CT)
Avail: NTIS HC A99/MF E03

Average of the in situ large scale electric and magnetic field measurements performed by the ISEE-1 satellite during 11 consecutive crossings of the magnetosheath - magnetopause - magnetosphere interface are used to obtain estimates on the efficiency of transmission of the magnetosheath - electric field to the magnetopause and on ExB flow amplitudes due to reconnection. Results are compared to their equivalent magnitudes expected from large scale reconnection theories. Measurement and model data suggest that the efficiency of the reconnection process during the ISEE-1 crossings is < 1. Author (ESA)

N85-24558# Royal Inst. of Tech., Stockholm (Sweden).
SATELLITE-BORNE ELECTRIC FIELD MEASUREMENTS WITH SPHERICAL DOUBLE PROBES
C.-G. Faelthammar, P.-A. Lindqvist, C. A. Cattell (California Univ., Berkeley), F. S. Mozer (California Univ., Berkeley), V. Formisano (Consiglio Nazionale delle Ricerche, Frascati, Italy), and A. Pedersen (ESTEC) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 125-129 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The characteristics of the electric field in the bow shock, dayside magnetopause, flanks of the magnetosphere, high latitude plasmasheet boundary and neutral sheet were determined using spherical double probes during the International Magnetospheric study. Electric field inhomogeneity and time variations make quantitative theoretical modeling of the magnetosphere electric field much more difficult than that of the magnetic field. Results reveal the inhomogeneous and dynamic character of magnetospheric plasma, and increase the importance of direct measurements of the electric field, carried out with much higher time resolution than corresponding measurements of plasma bulk motion. As the electric field often varies on a time scale compared to the satellite spin period, simultaneous three-axis measurements are important, to determine the full electric vector even when E.B = 0. Author (ESA)

N85-24559*# Los Alamos Scientific Lab., N. Mex.
ENERGETIC PARTICLE SOUNDING AT THE MAGNETOPAUSE AND IMPLICATIONS FOR MAGNETIC RECONNECTION
T. A. Fritz and D. J. Williams (APL) *In* ESA Achievements of the Intern. Magnetospheric Sutdy (IMS) Sep. 1984 p 131-135 refs Sponsored by DOE (For primary document see N85-24544 14-46)
(NASA Order S-12424)
Avail: NTIS HC A99/MF E03 CSCL 04A

Measurements of energetic particle three dimensional distributions used to infer the structure of the region of the subsolar magnetopause obtained from the Medium Energy Particle Experiment onboard the ISEE-1 and 2 satellites are reviewed. Although initial interpretations of two types of energetic particle signatures argued against the topology predicted by magnetic reconnection at the magnetopause, subsequent understanding of the meaning of these observations demonstrate that the energetic particle data are uniformly consistent with the theory. Author (ESA)

N85-24560# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
OBSERVATIONS OF ENERGETIC ELECTRON AND ION DISTRIBUTIONS NEAR THE MAGNETOPAUSE AT GEOSYNCHRONOUS ORBIT AND RELATED GROUND EFFECTS
A. Korth, G. Kremser, and G. J. Sofko (Saskatchewan Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 137-141 refs Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A GEOS-2 crossing of the dayside magnetopause during a geomagnetically disturbed period was selected to show clear signatures of the interconnection of field lines through the magnetopause. Pitch angle distributions of electrons and ions are found to be strongly asymmetric with respect to 90 deg. The asymmetries are interpreted in terms of field-aligned particle streaming. Comparisons of electron spectra provide evidence that the streaming electrons observed in the magnetosheath originate in the magnetosphere. Simultaneous ground observations with radar show regions with an outward flow and an antisunward flow at the poleward border of the field of view. The longitudinal width of these regions are 4 deg in angular extent on radar plots, or 200 km at geostationary orbit. The lifetime of these apparent merging regions is 6 to 12 min. Author (ESA)

N85-24561# Institut fuer Weltraumforschung, Graz (Austria). Space Research Inst.
STRUCTURE OF THE BOUNDARY LAYER FOR STEADY-STATE MAGNETOPAUSE RECONNECTION

M. F. Heyn, H. K. Biernat, V. S. Semenov (Leningrad State Univ.), and I. V. Kubyshkin (Leningrad State Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 143-146 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The nonlinear Petschek model of steady-state magnetic field-line reconnection is generalized to asymmetric conditions typical for the magnetopause. As a result the boundary layer, i.e., the region between an intermediate wave close to the magnetosheath and a slow shock close to the magnetosphere, consists of three sectors separated by a further slow shock and a contact discontinuity. If the magnetospheric Alfven speed exceeds the magnetosheath Alfven speed by a certain amount a rarefaction wave (slow expansion fan) develops instead of the inner slow shock. Author (ESA)

N85-24562*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
ELECTRIC FIELDS IN THE PLASMA SHEET AND PLASMA SHEET BOUNDARY LAYER
A. Pedersen, C. A. Cattell (California Univ., Berkeley), C.-G. Faelthammar (Royal Inst. of Tech., Stockholm), K. Knott, P.-A. Lindqvist (Royal Inst. of Tech., Stockholm), R. H. Manka (NAS-NRC, Washington, D.C.), and F. S. Mozer (California Univ., Berkeley) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 147-151 refs Sponsored by Swedish Board for Space Activities and ESA (For primary document see N85-24544 14-46)
(Contract NAS5-25770)
Avail: NTIS HC A99/MF E03

Data from the spherical double probe electric-field experiment on ISEE-1 were used to study plasmasheet/lobe boundary crossings during substorms, identified by plasma measurements and by using the electric field probes as a reference for measurements of the spacecraft potential. There are strong electric fields, with a dominant dawn-to-dusk component, throughout the boundary layer outside the plasmasheet for contracting and expanding motions of the plasmasheet and for different magnetic field directions. Characteristic amplitudes and durations are 5 to 10 mV/m and 5 to 15 min. The corresponding E x B vectors are always towards the plasmasheet. Author (ESA)

N85-24563# Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.
RESPONSE OF MAGNETOSPHERIC SUBSTORM ACTIVITY TO CHANGES IN THE INTERPLANETARY MAGNETIZED PLASMA
Gordon Rostoker *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 153-156 refs Sponsored by Canadian Natural Sciences and Engineering Research Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

During the data analysis phase of the IMS, electric current systems into the Earth's magnetotail were mapped. By recognizing the implications of vorticity in plasma convective flows in the magnetotail for the configuration of field-aligned currents threading the distant magnetosphere, a self consistent model was built up, in which it is inferred that auroral oval processes take place mostly on closed field lines. The finding that turnings toward the north of the interplanetary magnetic field after episodes of southward orientation trigger substorm expansive phases, enables the growth and decline of the tail magnetic field during episodes of substorm activity to be understood in terms of rerouting of the electric current systems in the magnetotail. Author (ESA)

N85-24564*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
THE APPLICATION OF DIMENSIONAL ANALYSIS TO THE PROBLEM OF SOLAR WIND-MAGNETOSPHERE ENERGY COUPLING
L. F. Bargatze, R. L. McPherron, D. N. Baker (LASL), and E. W. Hones (LASL) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 157-160 refs Previously announced as N85-20551 (For primary document see N85-24544 14-46)
(Grant NGL-05-007-004; Contract N00014-C-0158; Grant NSF ATM-83-18200)
Avail: NTIS HC A99/MF E03

The constraints imposed by dimensional analysis are used to find how the solar wind-magnetosphere energy transfer rate depends upon interplanetary parameters. The analyses assume that only magnetohydrodynamic processes are important in controlling the rate of energy transfer. The study utilizes ISEE-3 solar wind observations, the AE index, and UT from three 10-day intervals during the International Magnetospheric Study. Simple linear regression and histogram techniques are used to find the value of the magnetohydrodynamic coupling exponent, alpha, which is consistent with observations of magnetospheric response. Once alpha is estimated, the form of the solar wind energy transfer rate is obtained by substitution into an equation of the interplanetary variables whose exponents depend upon alpha. Author (ESA)

N85-24565*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
COUPLING OF THE SOLAR WIND TO MEASURES OF MAGNETIC ACTIVITY c92
R. L. McPherron, R. A. Fay, C. R. Garrity, L. F. Bargatze, C. Robert Clauer (Stanford Univ.), Craig Searls (Sandia National Lab., Albuquerque, New Mex.), and D. N. Baker (LASL) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 161-166 refs Sponsored by Inst. of Geophysics and Planetary Physics and Office of Academic Computing) (For primary document see N85-24544 14-46)
(Grants NGL-05-007-004; NSF ATM-83-18200; N000-14-C-0158)
Avail: NTIS HC A99/MF E03 CSCL 04A

Linear prediction filtering was used to generate empirical response functions relating the solar wind electric field to the magnetic indices, AL, AU, Dst and ASYM. The empirical response functions were convolved with solar wind observations obtained during the International Magnetospheric Study to predict the indices. The predictions are compared with the observed indices during two, 3-day intervals. Differences between the observed and predicted indices are discussed in terms of the linear assumption and in terms of physical processes other than direct solar wind-magnetosphere interaction. Author (ESA)

N85-24566# Beijing Univ. (China). Inst. of Space Physics.
MAGNETOTAIL CURRENT SHEET AND ENERGETIC PARTICLES OBSERVED ON ISEE-1
R.-L. Xu, L. Zheng, Z. Wu, and C. Y. Fan (Arizona Univ., Tucson) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 167-169 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The plasma current sheet in the magnetotail was determined by calculating the curl of the magnetic field observed on ISEE-1. It is found that the current is confined in the neutral sheet. The thickness of the sheet = 3Re, and current density = 0.015 amp/sqkm. The relation between the magnetic field and the energetic particles was also analyzed. When the magnetic field in the geomagnetic lobe has a northen component, the intensity of the protons and electrons increases. Author (ESA)

N85-24567# Thrace Univ., Xanthe (Greece).
ENTRY OF SOLAR ENERGETIC PROTONS INTO THE DISTANT PLASMA SHEET DEPENDENCE ON DISTANCE FROM THE NEUTRAL SHEET
P. Poutlis and E. T. Sarris *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 171-175 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The access of solar energetic protons at different parts of the distant plasmasheet is studied by simultaneous observations of step discontinuites in the solar proton intensities in the interplanetary space and inside the plasma sheet regime. It is determined that the time delay for access of the solar energetic protons to the position of the spacecraft inside the plasma sheet

increases as a function of its distance from the neutral sheet.
Author (ESA)

N85-24568# Thrace Univ., Xanthe (Greece).
ESTIMATE OF THE AMPLITUDE OF TRANSIENT ELECTRIC FIELDS IN THE MAGNETOTAIL
D. V. Sarafopoulos, E. T. Sarris, and G. P. Pavlos *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 177-180 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Observations of anisotropies in the angular distributions of energetic protons and electrons (300keV) in the Earth's distant plasma sheet indicated the occurrence of transient electric fields with a significant field aligned component, which last for 10 sec. Incorporating measurements of energy spectra and anisotropies by instruments on board the IMP-8 spacecraft during periods of intense antiparallel proton-electron field aligned streaming for a number of such events, the average magnitude of the transient electric field is estimated at 10mV/m. Author (ESA)

N85-24569# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
TIMING BETWEEN PARTICLE INJECTIONS AT THE GEOSTATIONARY ORBIT AND PARTICLE FLUX DECREASES IN THE DISTANT GEOMAGNETIC TAIL DURING SUBSTORMS
J. A. Sauvaud, A. Saint-Marc, J. Dandouras, H. Reme, A. Korth (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and G. K. Parks (Washington Univ., Seattle) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 181-185 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A multisatellite study was conducted on the temporal relationship between energetic particle injections observed at the geostationary orbit onboard GEOS-2, and decreases of thermal plasma sheet particle fluxes observed in the more distant geomagnetic tail onboard ISEE-1 and 2. A case by case analysis and a statistical study of 100 events show that particle injection and particle flux decrease are detected to within < 5 min of each other, for an average intersatellite distance of 15.7 RE. The observed spread in delta corresponds best to Alfven wave transit times. These particle phenomena are observed at the onset of the auroral zone magnetic bays. The results suggest that the dynamics of the inner and outer boundaries of the plasma sheet are closely related to each other and controlled by large scale processes that develop at substorm onset inside the magnetospheric tail and result in a crosstail current disruption.
Author (ESA)

N85-24570# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
PLASMA SHEET DYNAMICS DEDUCED FROM ISEE-1 AND -2 ENERGETIC PARTICLE FLUX DATA c75
J. Dandouras, H. Reme, A. Saint-Marc, J. A. Sauvaud, G. K. Parks (Washington Univ., Seattle), K. A. Anderson (California Univ., Berkeley), and R. P. Lin (California Univ., Berkeley) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 187-191 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

In order to investigate plasmasheet dynamics during substorms, three satellite yr of ISEE 1 and 2 energetic particle flux data were analyzed statistically. Results show that flux dropouts can be observed anywhere in the plasma sheet, independently of the satellite's geocentric distance, magnetic local time, and estimated distance to the neutral sheet. The dropouts can be observed for practically any combination of the AE index value and the satellite's estimated distance of the neutral sheet, which suggests that the plasma sheet is dynamic even during weak substorms. In substorms during which the satellites, though situated in the plasma sheet, did not detect any flux dropouts, the spatial distribution is found to be comparable to that of the flux dropout events. Predictions of plasma sheet thinning models are compared to the experimental results and it is concluded that neither model can account for all the observations. Author (ESA)

N85-24571# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
STREAMING REVERSAL OF ENERGETIC PARTICLES IN THE MAGNETOTAIL DURING A SUBSTORM
A. T. Y. Lui, D. J. Williams, T. E. Eastman, L. A. Frank, and S.-I. Akasofu *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 193-197 refs Prepared in cooperation with Iowa Univ., Iowa City and Alaska Univ., Fairbanks Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Reversal from tailward to earthward streaming ions during a substorm is studied with IMP-8 measurements of energetic particles, plasma, and magnetic field. The data sets display the classical signatures of a substorm neutral line. It is found that the times of streaming reversal of energetic ions and plasma do not coincide, and the velocity distribution in the tailward flowing plasma has a crescent shape, whereas that in the earthward flowing, plasma resembles a convecting Maxwellian. It is suggested that the streaming reversal in this event is due to the spacecraft traversing different plasma regions rather than due to the motion of an X-type neutral line moving past the spacecraft. Author (ESA)

N85-24572*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
PLASMA WAVES AT AND NEAR THE NEUTRAL SHEET
R. R. Anderson *In* ESA Achievements of the Intern. Manetospheric Study (date) p 199-204 refs (For primary document see N85-24544 14-46)
(Contracts NAS5-26819; N00014-76-C-0016)
Avail: NTIS HC A99/MF E03 CSCL 04A

The ISEE 1 and 2 plasma wave observations in the geomagnetic tail in the vicinity of neutral sheet crossings are reported. The relevance of the plasma wave observations to the magnetic field, plasma, and energetic particle observations is considered. Broadband electrostatic noise and low frequency electromagnetic bursts are characteristic of the plasma sheet boundary layer and regions near the neutral sheet especially in the presence of strong flows, fluctuationg currents and sharp gradients in the fluxes of few keV electrons and protons. However, exactly at the neutral sheet most wave intensities decrease dramatically and this observation has important implications for theories requiring anomalous resistivity from plasma turbulence at the neutral sheet. Author (ESA)

N85-24573*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
THE NEAR EARTH CURRENT SHEET: ISEE-1 AND -2 CASE STUDIES
D. J. McComas and C. T. Russell *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 205-208 refs (For primary document see N85-24544 14-46)
(Contract NAS5-25772; NASA Order S-50864)
Avail: NTIS HC A99/MF E03 CSCL 04A

Two crossings of the near Earth current sheet are examined using magnetic field and plasma data from ISEE-1 and 2. The current sheet thickness is measured to be 0.9 Re using a 2 satellite technique which greatly reduces the ambiguity of such measurements. Approximate pressure balance is found to exist between the diamagnetically dominated current sheet and surrounding, already high beta, plasma sheet. The accurate calculation of the sheet normal velocity with the two satellite technique allows the calculation of the current density distribution in the sheet. The crosstail current density is found to peak about an ion-gyroradius on both sides of the center of the sheet. A simple model consistent with these results is discussed. Author (ESA)

N85-24574# Beijing Univ. (China). Inst. of Space Physics.
THE DAWN-DUSK ASYMMETRY OF PARTICLES NEAR THE

NEUTRAL SHEET OF GEOMAGNETOTAIL

R.-L. Xu and Z.-H. Jin *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 209-211 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

The trajectories of 37664 particles in a dawn-dusk electric field in the neutral sheet of the geomagnetotail are numerically calculated. All particles start from a plane near the neutral line with uniform spatial distribution and isotropical pitch angle distribution. After the particles move through the neutral region, they are accelerated and exhibit a spatial distribution with a dawn-dusk asymmetry. The degree of the asymmetry depends on the energy range of particles, and the direction of asymmetry depends on the sign of charge. This result explains qualitatively the data observed on the IMP 7 and 8 satellites. Author (ESA)

N85-24575# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestriche Physik.

GROUND-BASED AND NEAR-EARTH OBSERVATIONS DURING THE IMS

Wolfgang Baumjohann *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 215-220 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

During the International Magnetospheric Study (IMS) ground-based networks of magnetometers, riometers, all-sky cameras, and coherent and incoherent backscatter radar facilities were installed or upgraded. With rocket and balloon-borne observations and measurements by low-altitude satellites the data were used to study the physics of the auroral ionosphere and magnetosphere-ionosphere coupling. Author (ESA)

N85-24576# Ruhr Univ., Bochum (West Germany). Theoretische Physik 4.

PARTICLE SOURCES, TRANSPORT, STORAGE AND PRECIPITATION

K. Schindler *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 221-229 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Energy coupling in the magnetotail and in compressed states of the magnetosphere is discussed. Cases where the magnetosphere responds directly to solar wind variations (direct response); where the energy received from the solar wind goes through a storage/release process; and where the magnetosphere combines these two processes, both with significant weight, are considered. The use of magnetospheric compression to study magnetospheric dynamics under varying parameters is outlined. It is suggested that if storage is essential, then a sudden storm commencement should not necessarily trigger a substorm.

Author (ESA)

N85-24577*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

RING CURRENT DYNAMICS AND PLASMA SHEET SOURCES

L. R. Lyons *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 233-242 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

The source of the energized plasma that forms in geomagnetic storm ring currents, and ring current decay are discussed. The dominant loss processes for ring current ions are identified as charge exchange and resonant interactions with ion-cyclotron waves. Ring current ions are not dominated by protons. At L<4 and energies below a few tens of keV, O+ is the most abundant ion, He+ is second, and protons are third. The plasma sheet contributes directly or indirectly to the ring current particle population. An important source of plasma sheet ions is earthward streaming ions on the outer boundary of the plasma sheet. Ion interactions with the current across the geomagnetic tail can account for the formation of this boundary layer. Electron interactions with the current sheet are possibly an important source of plasma sheet electrons. Author (ESA)

N85-24578# Kyoto Univ. (Japan).

IMS ADVANCES IN STUDIES OF FIELD-ALIGNED CURRENTS AND THEIR RELATED ELECTRODYNAMICS

Y. Kamide *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 243-256 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

During the International Magnetospheric Study the spatial distribution of the large-scale field-aligned currents was examined with respect to interplanetary magnetic field (IMF) parameters. The role of the field-aligned currents in the dayside polar cap including their IMF By dependence and seasonal dependence was elucidated. The three-dimensional current system was studied. The nature of the substorm current system was defined. The relative location of the field-aligned currents to ionospheric parameters, was traced. Numerical simulations were used to study the dynamics of the magnetosphere-ionosphere system. The large-scale characteristics of the system under steady state conditions are known, in that the measured key parameters are mutually consistent for average date sets. Author (ESA)

N85-24579# Alaska Univ., Fairbanks. Inst. of Geophysics.

ELECTRODYNAMICS OF MAGNETOSPHERE-IONOSPHERE COUPLING

J. R. Kan *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 257-266 refs (For primary document see N85-24544 14-46)

(Grant NSF ATM-83-17456)

Avail: NTIS HC A99/MF E03

A theoretical model of substorms is presented. Sudden enhancement of convection in the plasma sheet launches an Alfven wave propagating toward the ionosphere in each hemisphere. An Alfven wave carries with it a field-aligned current and a polarization electric field which is the convection electric field itself. When the field-aligned current density exceeds the loss-cone limit, a nonzero parallel electric field is forced into existence to accelerate the precipitating electrons so that the current density can be enhanced to the level required by magnetosphere-ionosphere coupling. Reflections of Alfven waves produce oscillations in the auroral electrojet currents, causing the Pi2 pulsation signature in ground-based magnetometer data. As the waves reflect between conjugate ionospheres, the field-aligned current density of the wave increases, causing the parallel electric field to develop, leading to the brightening of auroral arcs and the enhancement of ionospheric conductivity surrounding bright auroras. Author (ESA)

N85-24580*# Lockheed Aircraft Corp., Palo Alto, Calif.

RESULTS OF THE SCATHA ION COMPOSITION EXPERIMENT DURING THE IMS

J. M. Quinn and E. G. Shelley *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 269-272 refs Sponsored by Lockheed Independent Research (For primary document see N85-24544 14-46)

(Contracts NASw-3395; N00014-76-C-0444)

Avail: NTIS HC A99/MF E03 CSCL 04A

Hot plasma composition measurements of the near equatorial SCATHA spacecraft at geocentric distances of 5.3 to 7.8 RE, provided pitch angle distributions of ion composition in the vicinity of geosynchronous orbit. Pronounced pitch angle and spectral differences between ion species, and temporal variations within each species, are indicative of many of the complex source, energization, transport, and loss mechanisms at play in the magnetosphere. Ion populations of interest include field aligned ions below several keV which are primarily ionospheric; more energetic ions peaked at 90 deg pitch angle; and intense equatorially trapped ions below a few hundred eV, primarily protons. Ionospheric plasma is observed to take part in the substorm injection process, and there is evidence of an enhanced ionospheric source at the inner edge of the injection region.

Author (ESA)

N85-24581# Danish Space Research Inst., Lyngby.
MORPHOLOGY OF 2KEV-ELECTRONS OBSERVED BY GEOS 1
A. Bahnsen, M. Jespersen, T. Neubert, H. Borg (Kiruna Geophysical Inst.), P. Canu (Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux, France), and P. E. Frandsen (Denmark Univ., Lyngby) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 273-276 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Data on electrons between 0.3 and 22 keV collected by GEOS-1 are presented. The data collecting part of the GEOS 1 orbit covered L-values from 4 to 8 and local times from 04 to 21 hr. The flux was analyzed in terms of 2 temperature Maxwell distributions along pitch angle directions 90 and 15 deg. More than 80% of the data can be fitted to a sum of 2 Maxwell distributions (for each direction). The temperatures group around 0.45 and 6.5 keV, whereas the densities and energy flux vary strongly with activity level and with local time, showing the effects of convection and precipitation. Densities at 90 deg are consistently larger than densities at 15 deg by a factor of 2.5, indicating that anisotropic pitch angle distributions are prevalent in the outer magnetosphere. The low energy and high energy densities follow the same trends with respect to variation with local time and activity level, indicating that the two populations are interdependent. Author (ESA)

N85-24582# Consiglio Nazionale delle Ricerche, Frascati (Italy).
THE IONOSPHERIC O+ STREAMS IN THE MAGNETOTAIL BETWEEN 22 RE AND 6 RE
M. Candidi, S. Orsini, H. Balsiger (Bern Univ.), and M. Stokholm (Bern Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 277-282 refs Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The ISEE 2 EGD plasma experiment data were used with the ISEE 1 and GEOS 2 ion composition experiments data to investigate the properties of ionospheric O+ streams flowing in the Earth's magnetotail. Computation of the main parameters of these ions allows study of the topology of the regions where they are observed. Using the O+ ions as test particles, the configuration of the electric and magnetic field in the low latitude boundary layer, in the lobes, in the plasma sheet boundary layer and in the plasma sheet was examined. Author (ESA)

N85-24583*# Lockheed Aircraft Corp., Palo Alto, Calif. Research Lab.
ACHIEVEMENTS OF THE PLASMA COMPOSITION EXPERIMENT ON ISEE-1 DURING THE IMS
W. Lennartsson and R. D. Sharp *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 283-287 refs (For primary document see N85-24544 14-46)
(Contract NAS5-25773)
Avail: NTIS HC A99/MF E03 CSCL 04A

The ISEE-1 spacecraft measured energetic ion composition over a wide radial range in the near-equatorial magnetosphere, from close to the Earth to a distance of 23 RE. The Plasma Composition Experiment covers energies from 0 eV/e to 17 keV/e. Results for energetic O+ ions of terrestrial origin show that these ions are found in every region of the magnetosphere reached by the spacecraft and can have energy and pitch-angle distributions very similar to those of H+ ions. The O+ ions are the most numerous ions in the 0.1 to 17 keV/e energy range at $L < 5$ and are often a substantial part of the ion population at larger distances as well, especially during geomagnetically disturbed conditions. Author (ESA)

N85-24584# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
THE GEOS-2 ELECTRIC FIELD OBSERVATIONS AT TIMES OF SOLAR WIND DISCONTINUITIES c92
K. Knott, A. Pedersen, and U. Wedeken (Goettingen Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 289-291 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Electric field data obtained from GEOS-2 are compared with solar wind data and magnetometer recordings on the ground. Solar wind discontinuities, in particular a sudden storm commencement, cause strong electric field transients in the dayside magnetosphere. These transients are followed by PC-5 oscillations of considerable amplitude. The data also show the existence of electric fields during build-up, onset and expansion phase of subsequent substorms. Combined observations by GEOS-2, ISEE-3, IMP-8 and ground magnetometers provide information on propagation of transients in the magnetosphere, on the nature of large scale oscillations and on the overall convection pattern during periods when the interplanetary magnetic field has a negative Bz component. Author (ESA)

N85-24585# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.
ELECTRON AND PROTON PRECIPITATION IN MAGNETIC SUBSTORMS
D. J. McEwen and D. P. Steele *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 295-298 refs Sponsored by Canadian National Research Council and Canadian Natural Sciences and Engineering Research Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A multichannel meridian scanning photometer system monitored electron and proton precipitation patterns over a range from 59 to 79 deg invariant latitude during the International Magnetospheric Study. The developments of auroral substorms, mostly occurring in the premidnight sector, are traced, showing characteristically H beta emissions equatorward of the electron aurora prior to substorm onset. At onset there is a brightening of H beta and a poleward expansion. Following most such auroral substorms, in the postmidnight sector the aurora spreads into diffuse, patchy forms and pulsations begin, often lasting until morning. Author (ESA)

N85-24586# Geophysical Observatory, Sodankyla (Finland).
DEVELOPMENT OF AN AURORAL ABSORPTION SUBSTORM
Aarne Ranta and Hilkka Ranta *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 299-303 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Studies of energetic electron precipitation clarified the development of auroral absorption substorms on global scale. The activity begins near magnetic midnight and at magnetic latitude near 65 deg. Eastward propagation occurs at constant L shells and westward propagation towards higher L values. Substorm onset is usually preceded by activity near magnetic midnight and west of it. During the preonset phase an absorption bay moving slowly equatorward is observed, intensifying during the movement. The onset occurs at the western edge of the absorption bay. The particles causing the preceding bay are probably precipitated from the inner border of the plasma sheet. Preonset absorption is characterized by lack of short period pulsation activity. The westward propagating onsets coincide in the north with PiB and in the south with IPDP events. Author (ESA)

N85-24587# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
COORDINATED BALLOON-SATELLITE STUDIES OF ENERGETIC ELECTRON PRECIPITATION MECHANISMS
G. Kremser, A. Korth, S. Ullaland (Bergen Univ.), J. Stadsnes (Bergen Univ.), W. Baumjohann (Muenster Univ., West Germany), L. P. Block (Royal Inst. of Technol., Stockholm), K. M. Torkar (Austrian Acad. of Sci., Graz), W. Riedler (Austrian Acad. of Sci., Graz), B. Aparicio (Kiruna Geophys. Inst., Sweden), P. Tanskanen (Oulu Univ., Finland) et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 305-308 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Energetic electron precipitation was observed via X-ray measurements from three simultaneously flown balloons in a region conjugate to the location of the geosynchronous satellite GEOS 2. Data from the satellite particle, wave, and field experiments were used to study magnetospheric processes that act on the equatorial electron distribution during precipitation events. Most of the electron precipitation during a substorm was due to the interaction of electrons with whistler mode electromagnetic waves. Electron scattering in regions of excessive field line curvature and acceleration along the field lines were more important before and at substorm onset, respectively. The precipitation can be explained as the consequence of a change of the geomagnetic field configuration in the tail, followed by the arrival of two injection fronts behind which hot unstably distributed plasma sheet electrons were convected to the geosynchronous orbit. Author (ESA)

N85-24588# Bergen Univ. (Norway).

OBSERVATIONS DURING A MAGNETOSPHERE SUBSTORM TRIGGERED BY A STORM SUDDEN COMMENCEMENT (SSC): A CASE STUDY

S. Ullaland, J. Stadsnes, M. Haavaag, J. Bjordal, K. Broenstad, G. Kremser (Max-Planck Inst. fuer Aeronomie, Katenburg-Lindau, West Germany), A. Korth (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), L. P. Block (Royal Inst. of Technol., Stockholm), I. B. Iversen (Danish Space Res. Inst., Lyngby), K. M. Torkar (Austrian Acad. of Sci., Graz) et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 309-314 refs Sponsored by Austrian Science Research Council, Austrian Academy of Sciences, Deutsche Forschungsgeimschaft, Finnish National Research Council of Sciences, Royal Norwegian Council for Scientific and Industrial Research and Swedish Board for Space Activities (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Electron precipitation related to a magnetospheric substorm triggered by a sudden commencement (SSC) is summarized. Electron precipitation started well before substorm onset. No relationship between this very weak precipitation and the electron distribution at geosynchronous orbit is found. At the onset of the expansion phase of the substorm an electron precipitation arc developed, extending from Scandinavia (close to geomagnetic midnight) towards Greenland (near dusk). The poleward border of the arc expanded systematically polewards. An auroral fading at the onset of a PiB event is observed. A plasma injection front is recognized at GEOS-2 just after the strongest precipitation bursts. The magnetosphere was strongly compressed during the substorm. Time features of geosynchronous orbit energetic electron flux are similar to those found in the flux of precipitating electrons moving from L = 6.5 to at least L = 10.5 during the expansion phase of the substorm, and equatorwards to L = 5 during recovery.

Author (ESA)

N85-24589# Academy of Sciences (USSR), Apatity. Polar Geophysical Inst.

SAMBO-GEOS: SUBSTORM TRAPPED PARTICLE PARTICLE BOUNDARY MOVEMENTS, PARTICLE PRECIPITATION AND ACCELERATION

L. L. Lazutin, G. Gustafsson (Uppsala Ionospheric Observatory, Sweden), Khrushchinsky A. A., G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), A. O. Melnikov, W. Riedler (Austrian Acad. of Sci., Graz), Ya. Sakharov, K. M. Torkar (Austrian Acad. of Sci., Graz), and J.-P. Treilhou (CNES, Toulouse) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 315-318 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Ground-based, balloon and satellite measurements around a magnetospheric disturbance are analyzed. Field and particle dynamics are used to investigate the spatial configuration of the magnetospheric disturbance. Important physical processes are shown to occur in the region where the particles are quasi-trapped. Auroral particles are energized during the convective and explosive processes. The observed flux variations and the pitch angle distributions of auroral electrons are compared to tail reconnection model predictions. Author (ESA)

N85-24590# Institut fuer Weltraumforschung, Graz (Austria). Space Research Inst.

AURORAL X-RAYS AND EQUATORIAL ELECTRONS IN THE MORNING SECTOR

K. M. Torkar, W. Riedler, G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), A. Korth (Max-Planck Inst. fuer Aeronomie, West Germany), S. Ullaland (Bergen Univ.), J. Stadsnes (Bergen Univ.), J. Bjordal (Bergen Univ.), L. P. Block (Royal Inst. of Technol., Stockholm), I. B. Iversen (Danish Space Res. Inst., Lyngby), J. Kangas (Oulu Univ., Finland) et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 319-324 refs Sponsored in part by Austrian Science Research Council, Austrian Academy of Sciences, Deutsches Forschungsgeimschaft, Finnish National Research Council of Sciences, Royal Norwegian Council for Scientific and Industrial Research and Swedish Board for Space Activities (For primary document see N85-24544 14-46)

(Contract BMFT-WRK(243)-RV14-B12/73-SF21)

Avail: NTIS HC A99/MF E03

Precipitation of electrons in the morning sector of the auroral zone in relation to magnetospheric substorm activity was investigated by balloons and GEOS-2 during the International Magnetospheric Study. The relation between the distribution function of energetic electrons at GEOS-2 and the precipitation at and near the conjugate magnetic footprint in the auroral zone is studied. It is shown that the presence of drifting electrons is a necessary but not sufficient condition for precipitation.

Author (ESA)

N85-24591# Academy of Sciences (USSR), Apatity. Polar Geophysical Inst.

ON THE LOCATION OF THE SOURCE FOR X-RAY MICROBURSTS c93

A. A. Khrushchinsky, I. A. Kornilov, L. L. Lazutin (Graz Tech. Univ.), and W. Riedler *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 325-327 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

The fine time structure of multiple X-ray microbursts is investigated. According to the model, this structure depends on two parameters, one of which is the distance of the source from the ionosphere. Using the data of the SAMBO experiment on the time structure of X-ray multiple microbursts, the two parameters of the model are determined by a least squares method. The distance from the ionosphere is found to be 0.35 + or - 0.05 the length of the field line. Author (ESA)

N85-24592# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.

AFTERNOON RADAR AURORA AND POLAR CAP CONVECTION PATTERN

J. Oksman, R. Leitinger (Graz Technical Univ.), G. Hartmann (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and A. Hedberg (Uppsala Ionospheric Observatory, Sweden) *In its* Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 329-330 refs (For primary document see N85-24544 14-46)

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The location of the afternoon radar aurora determined from STARE measurements was compared with the location of visual aurora and of the ionization trough in the auroral ionosphere. It is found that the radar aurora is, in the afternoon, located considerably equatorwards of the visual aurora and the trough minimum. It is suggested that in this local time sector the convection electric field causes instability waves in the existing normal E region ionization, so that the equatorward boundary of the afternoon radar aurora is observed at the latitude where the convection electric field, which decreases with decreasing latitude, drops below the instability threshold. Consequently, an auroral radar such as STARE

could be used to monitor the equatorward boundary of the clockwise cell of the polar cap convection pattern in this time sector. Author (ESA)

N85-24593# Centre de Recherches en Physique de l'Environnement, Saint Maur des Fosses (France).
DISTURBANCE OF MIDLATITUDE ELECTRODYNAMIC PARAMETERS DUE TO THE MAGNETOSPHERIC CONVECTION
C. Mazaudier *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 333-337 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Two case studies of ionospheric disturbances in electric fields, currents, and winds during periods of geomagnetic storms detected by incoherent scatter radar are presented. The disturbances are shown to originate from two distinct physical mechanisms: penetration of electric fields to lower latitudes during times of rapid change in magnetospheric convection; and the action of the disturbed ionospheric dynamo driven by storm induced wind disturbances. One storm illustrates penetrative convection electric fields when the Bz component of the interplanetary fields turns southward and northward. The observed events on the following day are clearly identifiable as the delayed response of the disturbance ionospheric dynamo. Author (ESA)

N85-24594# Centre de Recherches en Physique de l'Environnement, Saint Maur des Fosses (France).
THE MAGNETOSPHERIC CONVECTION ELECTRIC FIELD AT IONOSPHERIC ALTITUDES: A CASE STUDY BASED ON STARE AND SAINT-SANTIN DATA
C. Mazaudier, M. Blanc, E. Nielsen (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and Min-Yun Zi (Peking University) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 339-342 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A period when the interplanetary magnetic field Bz component was southward and relatively steady over a prolonged period of time was used to study the steady state response of midlatitude fields to magnetospheric convection. Simultaneous measurements from two radars were analyzed using a semi-analytical time dependent convection model. An event illustrating the sole influence of the direct penetration of magnetospheric convection electric fields is presented. Author (ESA)

N85-24595# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
A BRIEF SUMMARY OF RESULTS DERIVED FROM SCANDINAVIAN TWIN AURORAL RADAR EXPERIMENT (STARE) OBSERVATIONS DURING IMS
E. Nielsen *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 343-347 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Coherent radar Doppler velocity measurements made with the Scandinavian Twin Auroral Radar Experiment (STARE) were used to estimate ionospheric electric fields, assuming the fluid approximation to be a valid description of the unstable waves in the ionosphere, which give rise to radar aurora. The estimates were made with good time resolution, high spatial resolution, and over a large area. Past work was reexamined in the light of an interpretation of radar Doppler velocity measurements based on STARE-EISCAT velocity comparisons. This interpretation yields more accurate estimates of the ionospheric electric field. This interpretation does not significantly change any past conclusions based on the fluid approximation. Author (ESA)

N85-24596# Academy of Sciences, Berlin (East Germany). Inst. fuer Atmosphaerenforschung und Geomagnetismus.
RESULTS OF THE LANGMUIR-PROBE EXPERIMENT ON BOARD INTERCOSMOS-18
A. Best, I. Best, H.-R. Lehmann, D. Johanning, W. Seifert, and C.-U. Wagner *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 349-353 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The satellite IK-18 observed parameters of the ionospheric-magnetospheric relationship. Measurements of the subauroral ionospheric trough were carried out. The dependence of the trough phenomena on geomagnetic activity, local time, height and other characteristic dimensions was studied. Results suggest that the trough is a result of ionospheric-magnetospheric interaction. Author (ESA)

N85-24597# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Dept. of Space Science.
COMPARISON OF MAGNETOSPHERIC AND IONOSPHERIC ELECTRIC FIELDS USING DIFFERENT EMPIRICAL MAPPING FACTORS
R. Schmidt, E. Nielsen (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and A. Pedersen *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 355-358 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Electric fields measured by the double probe experiment onboard the geostationary spacecraft GEOS 2 were mapped into the ionosphere and, after transformation into plasma drift velocities, compared with data taken by the ground based radar system STARE. Three different pairs of mapping factors were used: constant factors as for a dipolar magnetic field configuration; mapping factors varying with local time; and factors as function of the local equatorial magnetic field. It is shown that mapping with the latter mapping factors results in good agreement between data measured by STARE and onboard GEOS 2. Hence, the mapping formulas provide an easy and reliable method to map electric fields down to the ionosphere or with reciprocical factors out in the equatorial plane. Constant factors represent not more than a rough first order estimation as the associated error might become considerable. Author (ESA)

N85-24598# Finnish Meteorological Inst., Helsinki.
THE GEOS-2 E-FIELD BEHAVIOR DURING DYNAMIC AURORAL DEVELOPMENT NEAR THE SATELLITE FOOTPOINT
R. Pellinen, A. Huuskonen, M. Vallinkoski, A. Pedersen (ESTEC, Noordwijk, Netherlands), and R. Schmidt (ESTEC, Noordwijk, Netherlands) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 359-363 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Fourteen different events, containing GEOS 2 electric field and groundbased data, were analyzed. In the premidnight sector large scale field pulsations are found to be associated with the passage of a convection reversal boundary across the satellite footpoint. When the footpoint is located within the westward travelling surge near midnight, a dusk-sunward field response is recorded, occasionally preceded by a tailward field excursion. This may be due to an inductive effect of a downward field aligned current or simply due to a shift of the satellite footpoint across the surge. In the morning sector impulsive field variations have only a moderate response on the ground. This suggests that the location of the satellite footpoint is different in the evening and morning sectors. Author (ESA)

N85-24599# Uppsala Ionospheric Observatory (Sweden).
THREE-DIMENSIONAL CURRENT SYSTEMS AND ELECTRIC FIELDS DURING ACTIVE AURORA
Hermann J. Opgenoorth and Wolfgang Baumjohann (Max-Planck Inst. fuer Physik and Astrophysik, Garching, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 365-368 refs Sponsored by Deutsche Forschungsgeimschaft, Deutscher Akademischer Austauschdienst, Finnish Ministry of Education and Swedish Natural Science Research Council (For primary document see N85-24544 14-46)
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Using data from International Magnetospheric Study arrays of ground based instruments, models of three dimensional current flow associated with active auroras were derived. It is found that intensive localized field aligned currents are associated with the major features of active auroras in the whole nightside portion of the auroral oval. The primary auroral particle precipitation leads to ionospheric conductivity gradients and resulting electric polarization fields. Ionospheric polarization fields strongly influence the formation of magnetospheric substorm current systems.
Author (ESA)

N85-24600# Oulu Univ. (Finland).
TESTING OF SOME SUBSTORM FEATURES BY MULTIPLE BALLOON OBSERVATIONS
J. Kangas, P. Tanskanen, A. Korth (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West German), I. B. Iversen (Danish Space Res. Inst., Lyngby), M. M. Madsen (Danish Space Res. Inst., Lyngby), J. Bjordal (Bergen Univ.), K. Broenstad (Bergen Univ.), J. Stadsnes (Bergen Univ.), S. Ullaland (Bergen Univ.) et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 369-372 refs Sponsored by Austrian Science Research Council, Austrian Academy of Science, Dorschungsgeimschaft, Finnish National Research Council of Sciences, Royal Norwegian Council for Scientific and Industrial Research and Swedish Board for Space Activities (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Balloons launched during the SBARMO-79 balloon campaign covered an extended area between Northern Scandinavia and Iceland when a sequence of substorm activity occurred. The development of the activity was traced simultaneously at different meridians, using balloon X-ray and electric field measurements with ground based magnetic and riometer recordings and GEOS 2 observations. It is shown that the southward movement of the electron precipitation region before the onset of the substorm agrees with the E x B drift in the observed electric field. This precipitation is limited to the west of the breakup area. Observations around the onset of the substorm are discussed in terms of auroral fading.
Author (ESA)

N85-24601# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
CHARACTERISTICS OF THE ELECTRODYNAMICS OF AURORAL ARCS AS INFERRED FROM ROCKET AND GROUND-BASE OBSERVATIONS DURING IMS
G. Marklund *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 373-377 refs Sponsored by Swedish Board of Space Activities (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

High resolution in situ observations by sounding rockets of auroral phenomena are discussed. Results from the Substorm-GEOS rocket campaign and from simultaneous ground based observations show that Joule and particle heating are correlated during breakup but anticorrelated before. Auroral motion is governed by E x B/B sq drift prior to, but not during, breakup. Rees' steady-state model to calculate electron density profiles from measured particle spectra is generalized by inclusion of the time dependence. An auroral arc classification based on the relative influence on the arc electric field pattern of polarization and Birkeland currents is suggested, and applied to arc observations. High altitude potential distributions are presented. Author (ESA)

N85-24602# National Inst. of Polar Research, Tokyo (Japan).
THE RELATIONSHIP BETWEEN AURORAL ELECTROJET AND VISUAL AURORA
M. Ayukawa and K. Makita (Takushoku Univ., Japan) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 379-382 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Ground magnetic field and auroral observations in Antarctica during the International Magnetospheric Study were used to examine fluctuations of small scale auroral electrojet current regions and compare them to spatial and temporal variation of visual auroras using three ground stations data. It is shown that ionospheric currents obtained from zero point of Z component magnetic field variations follow movement of the auroral luminous regions. This result suggests that line current approximations are applicable to small scale auroral electrojet currents. Author (ESA)

N85-24603*# Iowa Univ., Iowa City.
FIELD-ALIGNED CURRENTS OBSERVED IN THE VICINITY OF A MOVING AURORAL ARC
C. K. Goertz and K. Bruening (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 383-385 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N85-24544 14-46)
(Grants NsG-763; NSF ATM-81-11126)
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The sounding rocket Porcupine F4 was launched into an auroral arc and the field aligned currents were independently deduced from magnetic field measurements; the horizontal current deduced from the electric field measurements and height integrated conductivity calculations; and measurements of electron fluxes. Above the arc the different methods agree. The magnetosphere acts as generator and the ionosphere as load. North of the arc, the first two methods disagree, possibly due to an Alfven wave carrying the observed magnetic field perturbation. The energy flow is out of the ionosphere. Here the ionosphere acts as generator and the magnetosphere as load.
Author (ESA)

N85-24604# Tokyo Univ. (Japan). Geophysics Research Lab.
ON-OFF CHARACTERISTICS OF AURORAL PULSATIONS
Tatsundo Yamamoto *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 387-390 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Observations of pulsating auroras with all sky TV cameras revealed that the luminosity fluctuation of pulsating auroras is a sequence of individual isolated pulses with almost constant pulse widths of two kinds (0.2 to 0.5 sec and 2 to 6 sec). These characteristics are discussed in relation to VLF/ELF wave particle interactions in the magnetosphere. It is suggested that the propagation effect of VLF-ELF waves in the plasma irregularities near the magnetospheric equatorial plane plays an essential role in provoking the rapid on-off switchings of precipitating electrons. Electromagnetic and electrostatic waves are possibly related to the precipitation pulsations.
Author (ESA)

N85-24605# Tokyo Univ. (Japan). Geophysics Research Lab.
MULTIPLE CORRELATION BETWEEN AURORAL AND MAGNETIC PULSATIONS
Takasi Oguti, Jack H. Meek, and Kanji Hayashi *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 391-394 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Multiple correlation analysis between ground magnetic pulsations observed at a control point and auroral pulsating patches in various parts of the sky observed by an all sky TV camera shows that the magnetic variations (time derivatives) can be well represented by linear combinations of luminosity fluctuation in various parts of the sky and that the linear coefficients, which relate the luminosity fluctuations to the magnetic fluctuations, can be stable for over 30 min. It is concluded that magnetic pulsation below a pulsating aurora is mainly due to conductivity fluctuation in the ionosphere caused by the pulsating precipitation of auroral electrons.
Author (ESA)

N85-24606# Tokyo Univ. (Japan). Geophysics Research Lab.
MULTIPLE CORRELATION BETWEEN AURORAL AND MAGNETIC PULSATIONS. PART 2: DETERMINATION OF ELECTRIC CURRENTS AND ELECTRIC FIELDS AROUND A PULSATING AURORAL PATCH

Takasi Oguti and Kanji Hayashi *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 395-398 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The electric currents induced in and around a pulsating auroral form are determined by breaking down the magnetic variation observed at a single station into the contributions from various pulsating auroral forms by the least squares method. Multiple correlation analysis shows that the magnetic deflections at ground points below a pulsating auroral form can be estimated even when many pulsating patches appear at the same time. A model calculation shows that the horizontal magnetic deflections, observationally determined, are fully explained by the combination of ionospheric and field aligned electric currents theoretically expected to be induced in and near a local enhancement of conductivity of a pulsating auroral patch under the existence of a uniform, convection electric field. Author (ESA)

N85-24607# Air Force Geophysics Lab., Hanscom AFB, Mass.
ON THE DYNAMICS OF THE WESTWARD TRAVELING SURGE
Paul L. Rothwell, Michael B. Silevitch (Northeastern Univ.), and Lars P. Block (Royal Inst. of Technol. Stockholm) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 399-403 refs (For primary document see N85-24544 14-46)
(Contract F19628-83-K-0014)
Avail: NTIS HC A99/MF E03

A unified model for the propagation of the Westward Traveling Surge (WTS) which can explain the diversity in the observed surge characteristics is developed. The direction of the surge motion depends on the presence of polarization charges on the poleward boundary. This is related to the efficiency with which the poleward ionospheric currents are closed off into the magnetosphere by the field aligned currents. Inclusion of the electron ion recombination rate modifies the surge propagation velocity and leads to explicit expressions for the conductivity profile. Sufficient precipitation current is required to overcome electron ion recombination in order for the surge to expand. When the precipitating current is less than this threshold the WTS retreats. The model describes the ionospheric response to the expansion and recovery phases of the magnetic substorm. Author (ESA)

N85-24608# Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Inst., Leningrad (USSR).
SOLAR WIND CONTROL OF ELECTRIC FIELDS AND CURRENTS IN THE MAGNETOSPHERE AND IONOSPHERE c92
O. A. Troshichev *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 407-416 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Solar wind-magnetosphere/ionosphere interactions were examined during the International Magnetospheric Study. Permanent field-aligned currents with a steady antisunward polar cap convection are due to steady generation of electric currents in the low-latitude boundary layer and at the boundary of the plasma layer during viscous-like solar wind during magnetosphere interaction. Merging of the interplanetary magnetic field (IMF) with geomagnetism causes growth of the polar cap size and symmetric enhancement of the antisunward convection across the polar cap in the presence of a southward IMF component, and a corresponding increase of the potential drop across the polar cap. It also causes polar cap contraction, asymmetric enhancement of antisunward convection, and displacement of the polar cap along the dawn-dusk meridian. Author (ESA)

N85-24609*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
IONOSPHERE-MAGNETOSPHERE COUPLING AND CONVECTION
R. A. Wolf and R. W. Spiro *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 417-426 refs (For primary document see N85-24544 14-46)
(Grants NAGw-482; NGR-44-006-137; NSF AM-82-06026; Contract F19628-83-K-0016)
Avail: NTIS HC A99/MF E03 CSCL 04A

The following international Magnetospheric Study quantitative models of observed ionosphere-magnetosphere events are reviewed: (1) a theoretical model of convection; (2) algorithms for deducing ionospheric current and electric-field patterns from sets of ground magnetograms and ionospheric conductivity information; and (3) empirical models of ionospheric conductances and polar cap potential drop. Research into magnetic-field-aligned electric fields is reviewed, particularly magnetic-mirror effects and double layers. Author (ESA)

N85-24610# Tokyo Univ. (Japan). Geophysics Research Lab.
MAGNETOSPHERE-IONOSPHERE INTERACTION THROUGH HYDROMAGNETIC WAVES
T. Tamao *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 427-435 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Magnetosphere-ionosphere interaction in two regimes is reviewed. In the first there is no significant kinetic energy flux of energetic particles along field lines, and the classical shear Alfven wave with its field aligned currents and Poynting flux plays an essential role in the localized interaction processes. Different responses of the ionosphere for the incidence of the shear Alfven wave and ducted fast magnetosonic wave are demonstrated. In the second regime where the field-aligned kinetic energy flux of particles cannot be neglected, wave dispersion and particle acceleration are discussed. Quantitative numerical simulations of the coupling interaction are surveyed. Author (ESA)

N85-24611# National Inst. of Polar Research, Tokyo (Japan).
Pc 1-2 PULSATIONS AND RELATED PHENOMENA: A REVIEW
Hiroshi Fukunishi *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 437-447 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Data from GEOS measurements of Pc 1-2 pulsations and ground-based magnetometers were used to study the generation and propagation of ion cyclotron waves in the magnetosphere. It is established that the presence of heavy ions and the anisotropy of energetic protons are essential. Satellite-ground conjugate observations reveal the condition for the propagation of ion cyclotron waves from the generation region in the magnetosphere to the ground. The discoveries of helium ion heating and generation of field-aligned electron beams and ELF electrostatic waves by Pc 1-2 waves help to explain wave-particle interaction in magnetospheric plasma. Satellite observations were conducted mainly at geostationary orbit, so periodic Pc 1 pulsations, commonly observed on the ground, were rarely observed in the magnetosphere. Types of Pc 1 pulsations with dot structures in f-t spectra were observed at auroral-zone and sub-cleft stations during the magnetic local morning hours. Author (ESA)

N85-24612# Muenster Univ. (West Germany). Inst. fuer Geophysik.
SPATIAL CHARACTERISTICS OF ULF PULSATIONS AND THEIR MODIFICATION BY THE IONOSPHERE: IMS RESULTS
K.-H. Glassmeier *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 449-457 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Ultralow frequency pulsation even and odd modes, as well as up to the tenth harmonic oscillations were observed during the International Magnetospheric Study. Observations of field variations across field lines support the field line resonance theory. Investigation of ionospheric modification of ULF pulsations reveals a significant ionospheric rotation of the wave's polarization ellipse. Theoretical studies indicate a strong influence of ionospheric conductivity gradients on this rotation. Author (ESA)

N85-24613# Natal Univ., Durban (South Africa). Dept. of Physics.
CONTRIBUTION OF THE SCANDINAVIAN TWIN AURORAL RADAR EXPERIMENT (STARE) RADAR TO THE UNDERSTANDING OF THE PHYSICAL MECHANISMS ASSOCIATED WITH Pc5 PULSATIONS
A. D. M. Walker *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 459-467 refs Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The Scandinavian Twin Auroral Radar Experiment observations were used with ground-based magnetometer arrays and satellites to examine Pc5 pulsations, during the International Magnetospheric Study. Field-line resonances over a limited range of latitude; and azimuthally propagating compressional pulsations with high azimuthal wave number were analyzed. The nature of toroidal resonances is understood to the extent that a detailed quantitative theory exists which predicts the observations with high precision. For compressional pulsations, the improvement of understanding is such that the data allow a very complete empirical picture of the standing wave to be given. Author (ESA)

N85-24614# Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.
AN EVALUATION OF THE CONTRIBUTIONS OF THE IMS TO EXPERIMENTAL AND THEORETICAL STUDIES OF ULF PLASMA **c75**
J. C. Samson *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 471-481 refs Sponsored by Canadian Natural Sciences and Engineering Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

During International Magnetospheric Study investigations of ULF magnetospheric plasma waves, the Scandinavian Twin Auroral Radar Experiment and ISEE-1 and 2 produced evidence of hydromagnetic (hm) resonances. Satellite and ground observations indicate that some of the energy of hm waves comes from Kelvin-Helmholtz instabilities near the magnetopause or low latitude boundary layer. Satellite observations of Pc 1 band pulsations emphasize the importance of heavy ions in the generation and propagation of these pulsations. Ground observations give a clearer picture of the source regions of structured Pc 1's. Substorm-associated intervals of pulsation with diminishing period are well understood, whereas the transient Pi 2's and PiB's remain a problem. Author (ESA)

N85-24615# Imperial Coll. of Science and Technology, London (England).
SOLAR WIND CONTROL OF MAGNETOSPHERIC CONVECTION **c92**
S. W. H. Cowley *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 483-494 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

During the International Magnetospheric Study, the physical processes which drive magnetospheric convection by coupling the magnetosphere and magnetosheath across the magnetopause were observed. Spacecraft data obtained at high and low altitudes indicate that viscously driven closed boundary layers typically contribute only 5 to 10 kV to the cross-magnetosphere voltage, while the observed reconnection-associated processes are compatible with a source of at least several tens of kV. The latter processes are shown to be strongly modulated by interplanetary magnetic field Bz, as required by the similar correlation observed in the total transpolar potential. These results support pre-IMS inferences that reconnection processes are dominant in driving magnetospheric convection. Author (ESA)

N85-24616# National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab.
MAGNETOSPHERIC EFFECTS ON THE UPPER ATMOSPHERE
George C. Reid *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 495-502 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Magnetospheric influence on the dynamics and chemical composition of the atmosphere are reviewed. The dynamics of the polar thermosphere is substantially modified, and at times dominated, by the momentum and energy supplied by the magnetosphere in the form of ion drag and Joule heating. The consequences for the upper thermosphere are now largely understood, but the effects on the lower thermosphere and mesosphere are unclear. Magnetosphere influence on atmospheric composition extends well down into the middle atmosphere, and perhaps even to the Antarctic ice cap. The auroral-zone source of odd nitrogen in the lower thermosphere was mapped. Its expansion to lower altitudes and latitudes was predicted by models and inferred by observations, while the odd-hydrogen enhancements caused in the mesosphere by solar-proton events were directly related to observed ozone depletions. Author (ESA)

N85-24617# Alaska Univ., Fairbanks. Inst. of Geophysics.
THEORY AND COMPUTER SIMULATION OF AURORAL KILOMETRIC RADIATION
L. C. Lee *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 505-509 refs (For primary document see N85-24544 14-46)
(Grant NSF ATM-83-17454; Contract DE-AT06-76ER-70005)
Avail: NTIS HC A99/MF E03

Theoretical and simulation studies of the cyclotron maser mechanism as applied to the auroral kilometric radiation (AKR) are reviewed. Computer simulation was used to study the linear growth and nonlinear saturation of electromagnetic radiations due to the loss-cone driven cyclotron maser process. In the nonlinear stage, the radiation saturates by turbulent scattering of resonant particles into the loss-cone (quasi-linear saturation). At saturation, the energetic keV electrons convert 1% of their initial energy to the radiation. In the presence of a continuous pump, the energy conversation to the AKR emission is more efficient and a significant amount of high energy (50 to 500 keV) electrons is produced. Author (ESA)

N85-24618# British Antarctic Survey, Cambridge (England). Space Plasma Physics Section.
THE IMS ADVANCES IN UNDERSTANDING TERRESTRIAL MYRIAMETRIC RADIATION
Dyfrig Jones *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 511-515 refs Original contains color illustrations (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Nonthermal continuum radiation (NTC) in the L-O electromagnetic mode pervading the magnetospheric cavity was investigated during the International Magnetospheric Study (IMS). A theory for generation involving linear mode-conversion in a density gradient, of upper hybrid (UH) to L-O mode waves, is supported by IMS observations. Close correspondence of NTC with UH waves and with density gradients is confirmed, as is the prediction that the emission occurs in narrow bands, which prompted its renaming as terrestrial myriametric radiation (TMR). The prediction that TMR would be beamed with respect to the magnetic field, is supported by a particularly stable event on GEOS 1. The TMR events observed on IMP 6 and HAWKEYE 1 show that the source regions can extend at least up to 10 deg mag latitude. Support for the linear mode-conversion theory is also derived from the observation by Voyagers 1 and 2 of analogous radiations at Jupiter and Saturn. Author (ESA)

N85-24619# Sussex Univ., Brighton (England). Plasma and Physics Group.
TERRESTRIAL CONTINUUM RADIATION STUDY DURING THE IMS
P. J. Christiansen, P. Gough, J. Etcheto (Centre de Rech. en Phys. de l'Environ. Terrestre, Issy-les-Moulineaux, France), J. G. Trotignon (CNRS, Orleans, France), K. Roennmark (Umea Univ., Sweden), and L. Stenflo (Umea Univ., Sweden) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p

517-520 refs Sponsored by UK Science and Engineering Research Council (For primary document see N85-24544 14-46)
(Contract CNES-214)
Avail: NTIS HC A99/MF E03

Terrestrial continuum radiation was studied using simultaneous, high frequency resolution observations onboard the GEOS and ISEE satellites. Triangulation of the sources shows plasmapause sources for escaping continuum on the night and early morning side. The fine structure of the radiation shows very narrow band lines implying very small source regions (radial extent = 10 km). Cut-off and spin modulation measurements reveal a significant X-mode component. When the satellite enters possible source regions, electrostatic noise is observed simultaneously close to the upper hybrid frequency and below the lower hybrid frequency. Observed orders of magnitude require a very high efficiency for linear coupling with electrostatic waves or nonlinear coalescence between upper and lower hybrid waves. Generation of electromagnetic waves through modulational instability and cavitational collapse of upper hybrid waves is discussed. Author (ESA)

N85-24620# National Inst. of Polar Research, Tokyo (Japan).
OBSERVATIONS OF THE MF-HF PLASMA WAVE EMISSIONS IN ACTIVE AURORAS BY THE SOUNDING ROCKET EXPERIMENTS AT SYOWA STATION
Hiroshi Miyaoka and Hiroshi Oya (Tohoku Univ., Japan) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 521-524 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Plasma waves in the range 0.1 to 10 MHz were observed in the polar ionosphere up to 230 km level by sounding rockets. Four categories of plasma wave emissions are identified with respect to the correlation to precipitating energetic particle data. These are the z mode waves generated by beam instability (cyclotron or inverse Landau type) due to the field-aligned auroral electrons; electrostatic plasma waves in the frequency range lower than the electron cyclotron frequency mode waves; continuum emissions emanating from the upper side of the ionosphere; and leaked auroral kilometric radiation, propagating down towards the ionosphere as whistlers. Author (ESA)

N85-24621# Radio Research Labs., Tokyo (Japan).
VLF EMISSIONS OBSERVED BY ISIS SATELLITES DURING THE IMS c32
T. Ondoh, S. Watanabe, and Y. Nakamura *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 525-528 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Antarctic plasmaspheric hiss observed by ISIS satellites is discussed. The ELF hiss observed in the mid and low-latitude ionosphere is plasmaspheric hiss which propagates down to the ionosphere from the equatorially outer plasmasphere bouncing back and forth via lower hybrid resonance reflections between the plasmaspheric hemispheres. The latitudinal variation of the dayside chorus frequency observed by ISIS satellites is close to that of one half of the equatorial electron gyrofrequency. This implies that the dayside chorus in the midlatitude ionosphere is the magnetospheric chorus propagating from the dayside magnetosphere. The nightside chorus frequency shows no significant latitudinal variation. The VLF saucer occurs relatively near, below or above, the satellite in the polar topside ionosphere, and it propagates as whistlers at large wave normal angles to the geomagnetic field lines. Author (ESA)

N85-24622*# Kyoto Univ. (Japan). Dept. of Electronical Engineering.
VLF WAVE-PARTICLE INTERACTION EXPERIMENTS BY EXOS-B/SIPLE STATION TRANSMISSIONS c32
I. Kimura, H. Matsumoto, T. Mukai (ISAS, Tokyo), K. Hashimoto, T. F. Bell (Stanford Univ., Calif.), and U. S. Inan (Stanford Univ., Calif.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 529-532 refs Sponsored by Japanese Ministry of Education, Science and Culture, Japan Society for the Promotion of Science, NASA and NSF (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The relationship between ground station signals and electron pitch angle distribution at L = 4 is reviewed, and signal intensity is discussed. There are two types of relationships between signals and electron distribution: (1) intensification of the signal by a distribution with a high pitch angle anisotropy of pancake type; and (2) triggering of emissions associated with transmissions by a high flux of electrons with low pitch angle anisotropy. The electric field intensity of ground signals is relatively low, which is consistent with those observed by IMP-6 and by a rocket. Author (ESA)

N85-24623# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ENERGETIC ELECTRON ANISOTROPY AND ELF WAVES ONBOARD GEOS. HOW DOES QUASI-LINEAR DIFFUSION WORK c32
J. Solomon, N. Cornilleau-Wehrlin, A. Korth (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), and G. Kremser (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 533-537 refs Sponsored by CNRS (For primary document see N85-24544 14-46)
(Contracts CNES-214; BMFT-WRK(243)-RV14-B12/73-SF21)
Avail: NTIS HC A99/MF E03

Amplification of electromagnetic electron cyclotron waves (100 Hz to 3 kHz) in the magnetosphere when an anisotropic distribution of energetic electrons (10 keV to 200 keV) is present is considered. Measurements of the electron flux in energy and pitch-angle and of wave spectra obtained onboard GEOS-1 and 2 are examined. When an equilibrium situation with waves continuously emitted is established, the anisotropy (A) is frequency-dependent and tends towards the critical anisotropy (Ac) in the frequency range where pitch-angle diffusion acts. A model for the equilibrium differential flux of electrons in the presence of waves is established. It is demonstrated that waves are not emitted when A < or = Ac or when the integrated growth rate along a given line of force is not large enough to maintain steady state.
Author (ESA)

N85-24624# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
ELF CHORUS IN THE EARTH'S OUTER MAGNETOSPHERE c32
A. E. Antonova *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 539-542 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The dayside ELF (10 to 1500 Hz) chorus observed during geomagnetically quiet times at high geomagnetic latitudes in the outer magnetosphere and the polar ELF emission observed at low altitudes and on the Earth's surface are analyzed in association with the geomagnetic field and the energetic electron distributions. It is shown that chorus generation may be related to the pitch-angle anisotropy of resonant electrons trapped in the high-latitude magnetic field minima adjacent to the dayside polar cusp.
Author (ESA)

N85-24625# Ceskoslovenska Akademie Ved, Prague.
DEUTERON WHISTLERS AT LOW LATITUDES IN THE LOW ALTITUDE TOPSIDE IONOSPHERE c32
J. Boskova, F. Jiricek, and P. Triska *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 543-547 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF A01

Upgoing and downgoing deuteron whistlers were found on VLF records made by the Intercosmos 5, 14, and 19 satellites in low geomagnetic latitudes even at heights < 1000 km. To account for them, the admixture of M/Q=2 ions in the plasma model consisting of electrons and H+, He+ and O+ ions was introduced. Relations derived for the calculation of characteristic frequencies in a five-component plasma are given, as well as the

values of characteristic plasma frequencies calculated on this basis. The observed features of upgoing and downgoing deuteron whistlers are explained by the calculation results, and conclusions for plasma diagnostics are drawn. The significance of variations of the He+ content in the plasma of low geomagnetic latitudes for observations of downgoing proton and deuteron whistlers is revealed. Author (ESA)

N85-24626# China Scientific and Technical Univ., Hofei.
LOW-LATITUDE DUCTED WHISTLERS OBSERVED AT SANYA, HAINAN, CHINA c32
S. Wang and Y. Wang *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 549-552 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Observations of whistler, multiwhistler, and tweek received at Sanya (18.24 N, 109.5 E; magnetic latitude 7.04 N) China are discussed. The physical features of low-latitude whistlers are studied. Results show that ducted whistlers propagating along the field-aligned ducts can be received at low latitude, and that whistler ducts also exist in the ionosphere. The critical cut-off latitude of ducted whistlers may be located at the region with a magnetic latitude < 7.04 N. Author (ESA)

N85-24627# Radio Research Labs., Tokyo (Japan).
WHISTLER OBSERVATION AT OKINAWA, JAPAN DURING THE IMS c32
T Ondoh, M. Kotaki, Y. Nakamura, and S. Watanabe *In* ESA Achievements of a Intern. Magnetospheric Study (IMS) Sep. 1984 p 553-557 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Observations of low-latitude whistlers were conducted at Okinawa (geomagnetic lat 15.3 N) a subtropical region with no clear seasonal variations in whistler dispersion. The average diurnal variation of whistler dispersions varies from 20 root s in the evening to 9 root s at dawn. The occurence frequency of whistlers peaks in the winter night and has no evening peak. Whistler dispersions fit well computed ones along the International Geomagnetic Reference Field line passing through Okinawa. The correlation coefficient between whistler dispersions and F0F2 at Okinawa is 0.76 for the winter months. Whistler activity is sporadic and increases with increasing local geomagnetic activity. Results of whistler direction finding show that arrival directions of whistlers lie within 30 deg off the local zenith in the south-east. Observations support the ducted propagation of low-latitude whistlers. Author (ESA)

N85-24628# British Antarctic Survey, Cambridge (England).
WHISTLER MODE WAVES NEAR THE PLASMAPAUSE: RESULTS FROM THE IMS VLF EXPERIMENT AT HALLEY, ANTARCTICA c32
A. J. Smith, M. Lester (Sheffield Univ., England), J. P. Matthews (Sheffield Univ., England), and K. H. Yearby (Sheffield Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 559-562 refs Sponsored by UK Science and Engineering Research Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

During the International Magnetospheric Study (IMS) a program of wide band VLF recordings was carried out at Halley (76S, 27W, L=4), coordinated with related observations at other L=4 Antarctic stations, including SEAL, an unmanned automatic observatory deployed specifically for the IMS. Using whistler data from Halley and Siple, plasmapause structures of scale size 0.5L and 30 deg in longitudinal extent were investigated. Two station (Halley-SEAL and Halley-Palmer) direction-finding on whistlers yielded results on whistler mode propagation near the plasmapause, providing evidence of coupling across the plasmapause between whistler ducts, and of non-field-aligned propagation at low altitudes. The properties of magnetospheric line radiation were studied using Halley IMS data. Author (ESA)

N85-24629# British Antarctic Survey, Cambridge (England).
CONJUGACY OF ELF-VHF EMISSIONS NEAR L=6 c32
Natsuo Sato and Hiroshi Fukunishi *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 P 563-567 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Conjugate observations of ELF-VLF emissions, magnetic pulsations and auroras were carried out in Antarctica and Iceland. Ray paths suggest that differences in intensities of auroral and polar chorus emissions at the conjugate points are due to different propagation paths from the generation regions in the magnetosphere to the ground, since the magnetic field configuration and the plasma density distribution along the lines are different between the Northern and Southern Hemispheres. Nonconjugacy of auroral hiss emissions is due to the higher growth rate of whistler mode waves excited by auroral electrons in the winter hemisphere topside ionosphere. Quasi-periodic VLF emissions with period of 15 to 50 sec observed simultaneously at the conjugate-pair stations suggest that the emissions are generated near the equatorial regions in the magnetosphere and propagate to both hemispheres along the field lines. Author (ESA)

N85-24630# Banaras Hindu Univ., Varanasi (India). Inst. of Applied Physics.
GENERATION AND PROPAGATION OF ELECTRON CYCLOTRON HARMONIC WAVES c32
R. N. Singh, R. Prasad, and V. Singh *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 569-573 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The dispersion equation for electron cylotron harmonic waves (ECHW) is obtained, using Maxwellian distribution functions consisting of cold and hot components with parallel and perpendicular velocities, via Vlasov's and Poisson's equations. The distribution of parallel and perpendicular velocity ratios of the hot and cold plasma components provide energy sources for instability of these waves. The real part of the dispersion equation is used to illustrate the dispersion features of ECHW and the imaginary part to compute the ECHW decay rate. Variations of decay rate with wave and plasma parameters is studied. The IM [1/D1(omega, k)] is a measure of spectral power of ECHW. Using the particle approach, the time averaged energy emitted in the form of ECHW is computed and its line shape is shown. Author (ESA)

N85-24631# British Antarctic Survey, Cambridge (England).
THEORETICAL STUDIES OF ELECTRIC CYCLOTRON HARMONIC (ECH) WAVES BASED ON EXPERIMENTAL DATA FROM GEOS 1 c32
R. B. Horne and P. J. Christiansen (Sussex Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 575-579 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Three wave events demonstrating the 4 classes of electron cyclotron harmonic (ECH) waves observed by GEOS-1 are presented. Models of the electron distribution function were constructed from the simultaneously observed particle data and used to solve the electrostatic dispersion relation and calculate the wave spatial growth rates. In the first event it is shown that changes in the cold electron distribution were responsible for large wave amplitude variations of strong ECH waves near the local upper hybrid frequency fu. In the second event it is shown that strong cyclotron damping and wave propagation effects in a plasma density gradient were responsible for the apparent frequency jumping of very weak ECH waves near fu. In the third event it is demonstrated that complex variations in the electron distribution < 1keV led to the change in wave emission class. Author (ESA)

N85-24632# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ROLE OF EQUATORIAL ELECTRON CYCLOTRON HARMONIC (ECH) WAVES IN THE GENERATION OF DIFFUSE AURORAS. CONTRIBUTION OF THE GEOS IMS SPACECRAFT c32

P. Canu, G. Belmont, and D. Fontaine *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 581-584 refs (For primary document see N85-24544 14-46)
(Contract CNES-214)
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A statistical study of the strongest electron cyclotron harmonic (ECH) waves observed at the geostationary orbit by GEOS 2 was performed. A morphology of these emissions is presented. Results reveal high latitudinal confinement of ECH waves (1 deg) at the magnetic equator. The strongest waves are observed in the dayside magnetosphere. In the nightside, 3/2 Fce waves observed are not intense enough to put plasmasheet electrons in strong pitch-angle diffusion and cause the diffuse aurora. Author (ESA)

N85-24633# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ANOMALOUS HEATING OF IONOSPHERIC COMPONENTS (THERMAL E- AND He+) VIA INTENSE ION CYCLOTRON WAVES (ICW'S)
A. Roux, N. Cornilleau-Wehrlin, S. Perraut, R. Gendrin (Bern University), D. T. Young, G. Wrenn, A. J. Norris, J. Johnson (Mullard Space Science Lab., Dorking, England), and J. L. Rauch *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 585-588 refs (For primary document see N85-24544 14-46)
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It is shown that initially thermal He+ ions (1 eV) are accelerated in a direction transverse to the magnetic field up to 100 eV in magnetospheric plasma. Evidence for the acceleration of thermal electrons in a direction parallel to the magnetic field is given. A consequence of these accelerated electrons is the generation of ELF electrostatic waves, the amplitude of which is modulated at the ion cyclotron wave frequency. Author (ESA)

N85-24634# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
PROPAGATION AND AMPLIFICATION OF ION CYCLOTRON WAVES (ICW'S) IN A MULTICOMPONENT PLASMA. THE EARTH MAGNETOSPHERE AS A GIANT MASER FOR ALFVEN WAVES c32
A. Roux, S. Perraut, C. deVilledary, A. Korth, G. Kremser (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), J. L. Rauch, and D. T. Young (Bern Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 589-591 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Ion cyclotron wave (ICW) propagation along geomagnetic field lines was studied with GEOS 2 (at the equator) GEOS 1 (at geomagnetic latitude = 20 deg) and a ground based station (at the magnetic footprint of GEOS). The catalyzing role of thermal He+ ions in ICW generation was investigated. Results suggest that mirror He+ ions play a role in destabilizing ICW's. These observations together with a ray tracing show that given a sufficient amount of thermal He+, ICW's bounce between He+ induced mirrors; thus ICW's undergo, in an He+ rich plasma, a feedback amplification. Then an unstable medium, the equatorial region, is inserted between two mirrors which are due to the presence in the magnetospheric plasma of thermal He+ ions. This situation is similar to that of masers. Author (ESA)

N85-24635# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
MAGNETOSONIC WAVES AND THEIR RELATIONSHIP WITH ENERGETIC PROTONS
S. Perraut, P. Robert, A. Roux, A. Korth (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), G. Kremser (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), J. A. Sauvaud (Centre d'Etude Spatiale des Rayonnements), and J. M. Bosqued (Centre d'Etude Spatiale des Rayonnements) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 593-598 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Monochromatic waves with frequencies close to or above proton gyroharmonics were observed in the vicinity of the geomagnetic equator by the GEOS spacecraft. The waves consist of harmonically-related emissions and propagate in a direction perpendicular to the DC magnetic field. The frequency spectrum indicates strong nonlinear coupling between the components of the spectrum. Two different energy sources are identified for destabilizing these waves : a ring-like distribution of 10 keV protons, and a sharp drift boundary of these protons. Both kinds of proton distribution can excite a nonresonant instability (flute mode) near the proton gyrofrequency and its harmonics. Experimental results are compared to growth rate calculations.
Author (ESA)

N85-24636# Oulu Univ. (Finland). Dept. of Physics.
SHORT-PERIOD MAGNETIC PULSATIONS DURING SUBSTORMS
J. Kangas, T. Boesingr, and T. Pikkarainen *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 599-602 refs Sponsored by Finnish National Research Council of Sciences (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Coordinated observations of auroral phenomena together with magnetic pulsation recordings at a dense network of stations were used to study substorm processes and generation of substorm-associated magnetic pulsations. It is shown that a PiB magnetic pulsation event is a good measure of the onset and intensification of the substorm. The generation of PiB pulsations is closely connected to localized field-aligned upward currents. Intervals of pulsation with diminishing period (IPDP) type wave events are a manifestation of the westward expansion of the substorm. The source region of IPDP pulsations may expand > 100 deg in east-west direction in the course of the substorm. The source also moves inwards as the frequency of pulsations increases.
Author (ESA)

N85-24637# Tokyo Univ. (Japan). Geophysics Research Lab.
SUBSTORM ASSOCIATED PC 1 EMISSION IN THE MORNING SUB-CLEFT LATITUDES
K. Hayashi, S. Kokubun, T. Oguti, T. Kitamura (Kyushu Univ., Japan), O. Saka (Kyushu Univ., Japan), and T. Watanabe (British Columbia Univ., Vancouver) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 603-607 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A PC 1 geomagnetic pulsation which appears with a group of dot-like shapes in frequency-time displays in the morning sector of the sub-cleft latitudes, called sub-cleft morning dots (SMD) was observed. The correspondence of high latitude geomagnetic disturbances detected on the ground to SMD is > 50%.
Author (ESA)

N85-24638# Newcastle Univ. (Australia). Dept. of Physics.
PC 1 PULSATION SOURCE REGIONS AND THEIR RELATIONSHIP TO THE PLASMA PAUSE
B. J. Fraser, W. J. Kemp, and D. J. Webster *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 609-613 refs Sponsored by Australian Research Grants Scheme, Australian Radio Research Board and Newcastle University (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Ionospheric waveguide propagation and source location techniques were used on data from a low latitude network of 5 stations (L = 1.8 to 2.8) and 1 at higher latitude (L = 5.4) to determine the exit region of Pc1 wave energy from the magnetosphere into the ionosphere. Interstation propagation time delays and polarization techniques determined the source location of individual Pc1 emissions to be in the L = 2.9 to 4.7 region, which is near or inside plasmapause positions determined statistically or directly from ISEE data. Elliptical Pc1 wavefronts in the waveguide were modeled using the full correlation ionospheric drift analysis technique to estimate the wavefront parameters. This

wavefront geometry also explains the pattern of group velocities observed. Author (ESA)

N85-24639# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.

LONG-PERIOD MAGNETOSPHERIC PULSATIONS OBSERVED WITH AN ELECTRIC FIELD EXPERIMENT IN THE MAGNETOSPHERE

Hans Junginger and Wolfgang Baumjohann (Max-Planck Institut fuer Max-Planck Institut fuer Physik und Astrophysik, Garching, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 615-618 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Electric field fluctuations with periods between 150 and 600 sec in the dayside magnetosphere were been observed nearly continuously during the lifetime of the electron beam experiment onboard GEOS-2. For the majority of the pulsations polarization characteristics, orientation of the wave ellipses, and wave Poynting vectors are consistent with solar wind driven surface waves on the outer boundaries of the magnetosphere as energy sources of the oscillations. Author (ESA)

N85-24640*# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Plasmas and Fields Branch.

MAGNETOSPHERIC PULSATIONS OBSERVED BY ISEE 1 AND 2 SATELLITES

H. J. Singer, W. J. Hughes (Boston Univ.), C. T. Russell (California Univ., Los Angeles), and R. Grard (ESTEC, Noordwijk, Netherlands) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 619-623 refs (For primary document see N85-24544 14-46)

(Contract NAS5-25772; Grant NAG5-5237)

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The ISEE 1 and 2 spacecraft studied whether observed amplitude variations in hydromagnetic waves were due to the motion of the spacecraft through a time stationary structure or were due to temporal changes. The data provide evidence for spatially limited standing hydromagnetic wave resonant regions. The standing wave harmonic and Poynting vector were deduced from the simultaneous observations of the wave magnetic and electric field. Author (ESA)

N85-24641# Academy of Sciences (USSR), Apatity. Polar Geophysical Inst.

THE SAMBO-GEOS EXPERIMENT: A PS-6 EVENT FROM GROUND-SATELLITE OBSERVATIONS

A. A. Khrushchinsky, G. Gustafsson (Uppsala Ionospheric Observatory, Sweden), A. Korth (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), G. Kremser (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), L. L. Lazutin, A. O. Melnikov, W. Riedler (Austrian Academy of Sciences, Graz), Ya. Sakharov, K. M. Torkar, and V. Zhavkov *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 625-627 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Long period magnetic field pulsations of Ps-6 type were investigated using balloon and GEOS-2 data and networks of ground-based observations in Scandinavia and Kola Peninsula. The variations are found to be associated with north-south oriented auroral arcs moving westward in the evening sector. The passage of the front is accompanied by variations of the energetic electron and proton distributions and by precipitation of electrons. The westward velocity of 1 deg/min is of the order of the drift velocity of energetic protons. Author (ESA)

N85-24642# Kakioka Magnetic Observatory (Japan).

SUDDEN STORM COMMENCEMENT (SSC) ASSOCIATED HYDROMAGNETIC VARIATIONS AT GEOSYNCHRONOUS ALTITUDE AND ON THE GROUND

M. Kuwashima and H. Fukunishi (National Inst. Polar Research, Tokyo) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 629-632 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Sudden storm commencement (SSC) associated magnetic variations were studied using data from geosynchronous satellites and ground observations. The pronounced local-time asymmetries are found for the amplitude of SSC, and for the directions of the initial movement of Psc oscillations. It is confirmed that the SSC signal propagates at 450 to 700 km/sec across the field lines in the magnetosphere. Author (ESA)

N85-24643# Danish Space Research Inst., Lyngby.

OBSERVATIONS OF A PULSATION EVENT FROM THE GROUND WITH BALLOONS AND WITH A GEOSTATIONARY SATELLITE

I. B. Iversen, L. P. Block (Royal Institute of Technology, Stockholm), K. Broenstad (Bergen Univ.), R. Grard (ESTEC, Noordwijk, Netherlands), G. Haerendel, H. Junginger (ESTEC, Noordwijk, Netherlands), A. Korth (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), G. Kremser (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), M. Madsen, J. Niskanen (Oulu Univ., Finland) et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 633-638 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

A magnetospheric pulsation event with a period of 6 to 8 min was observed with satellite and ground based instruments in the morning sector. The GEOS 2 satellite observed a magnetosonic wave with a Poynting vector directed towards the Earth. The variations of the electric field at the satellite are almost identical to those at the northern footprint of the geomagnetic field line through the satellite. Balloon measurements of auroral X-rays and particle and VLF measurements on the satellite suggest the existence of a wave-particle interaction process. Author (ESA)

N85-24644# Academy of Sciences (USSR), Moscow. Inst. of the Earth Physics.

RESULTS OF ULF-WAVE INVESTIGATIONS IN THE USSR c32

V. A. Troitskaya *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 639-642 (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

International Magnetospheric Study investigations of ULF waves are summarized. Studies of global distribution of ULF waves, using meridional and latitudinal chains of stations, as well as regional ones with specific arrangements of observation points; simultaneous studies of ULF waves on the ground and on satellites; investigations of ULF-waves at high latitudes; methods of diagnosing solar wind parameters and processes in the magnetosphere using results on the morphology and correlative ties of ULF waves with other geophysical phenomena; and studies of the structure and inhomogeneities of solar wind streams from different sources on the Sun are discussed. Author (ESA)

N85-24645# Department of Scientific and Industrial Research, Wellington (New Zealand). Lab. of Physics and Engineering.

SATELLITE, AURORAL RADAR AND GROUND MAGNOMETER OBSERVATIONS OF TRANSIENT ULF PULSATIONS c32

E. M. Poulter, W. Allan, J. G. Keys, K.-H. Glassmeier (Muenster Univ., West Germany), E. Nielsen (Max-Planck Institut fuer Aeronomie, Katlenburg-Lindau, West Germany), and H. Junginger (Max-Planck Institut fuer Physik und Astrophysik, Garching, West Germany) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 643-647 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

High latitude transient Pc5 pulsations having period variation with latitude were examined using International Magnetospheric Study instruments. It is shown that the pulsations have the characteristics of toroidal resonances of individual geomagnetic field shells. Results for an event observed by GEOS 2, the

Scandinavian Twin Auroral Radar (STARE) and the Scandinavian Magnetometer Array are given. This event was generated by a compressional hydromagnetic pulse propagating within the magnetosphere. Ion mass densities in the equatorial plane are determined from 64 transient events observed by either STARE or the Slope Point radar in New Zealand. These mass densities require H+ ion densities in the range 1 to 10/cc and 50% O+ ions at geosynchronous orbit. Author (ESA)

N85-24646# British Antarctic Survey, Cambridge (England).
THE LATITUDINAL VARIATION OF GEOMAGNETIC PULSATION AMPLITUDE AND PHASE
H. Gough and D. Orr (York Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 649-654 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A model which predicts the latitudinal amplitude and phase of geomagnetic pulsations as seen on the ground is described. The model treats each field line as a separate harmonic oscillator with a natural frequency equivalent to the standing wave frequency. The model flux tubes can be driven by a variety of monochromatic or pulsed waves. Given an assumed variation of natural frequency with latitude, the latitudinal resonant widths of continuous pulsations were examined for different damping estimates and conditions. Impulsively generated pulsations yield information in the damping, and are used to simulate short-lived daytime or nighttime pulsations. An interval of quiet magnetospheric activity when GEOS-1 particle estimates showed that O+ ions were an important component in the plasmatrough is considered. The charactetistics of five different pulsation events recorded in the interval are compared with model results. Author (ESA)

N85-24647# Goettingen Univ. (West Germany). Inst. fuer Geophysik.
MAGNETIC PULSATIONS RECORDED IN NORTHERN SCANDINAVIA DURING THE IMS; A STUDY OF PC 4-5 EVENTS
U. Wedeken, A. Maul, J. Woch, O. Hillebrand, and H. Voelker *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 655-661 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Ground magnetometers in northern Scandinavia and the geostationary satellites GEOS-2 and ATS-6 supplied data for a study of Pc4 and Pc5 events. A morning Pc5 and a giant pulsation event (pg) are described. It is assumed that both events correspond to the fundamental mode of a resonant wave. The Pc5 is governed by a toroidal mode and gets its energy from a surface wave excited near the magnetopause. The pg shows at GEOS-2 the largest magnetic perturbation along the ambient field, and the most likely energy source is bounce-drift resonance with medium energy (5 keV) ions. Author (ESA)

N85-24648# Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.
CHARACTERISTICS OF PC 4,5 PULSATIONS AND THEIR SOURCE MECHANISMS
Gordon Rostoker and John C. Samson *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 663-666 refs Sponsored by Canadian Natural Sciences and Engineering Research Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Energy supply from Kelvin-Helmholtz instabilities (K-H) on the magnetopause boundary to Pc 4,5 pulsations is discussed. International Magnetospheric Studies data support this possibility except that the K-H most likely occurs in the shear zone across the interface separating the low latitude boundary layer and central plasma sheet. Changes in the frequency-spectra and power of pulsations in intervals with changes in magnetospheric substorm activity suggest an intimate connection between dayside Pc 4,5 and substorms. The Pc 4,5 pulsations, substorm-associated Ps 6 variations and westward traveling surges may all be manifestations of K-H's at the interface between the low latitude boundary layer and the central plasma sheet. Author (ESA)

N85-24649# Muenster Univ. (West Germany). Inst. fuer Geophysik.
GROUND MAGNETIC OBSERVATIONS OF HIGH-LATITUDE Pi2 PULSATIONS: SCANDINAVIAN MAGNETOMETER ARRAY RESULTS
K. H. Glassmeier, W. Baumjohann, J. Behrens, and M. Lester (York Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 667-671 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Observations of Pi2 pulsations made with the closely spaced Scandinavian Magnetometer Array near the break-up region and east of it, within the eastward electrojet region, are reviewed. The association of these pulsations with the substorm current system is discussed and it is concluded that the Pi2 signals recorded near the break-up region can be understood as periodic modulation of the upward field-aligned current within the head of the westward travelling surge. Pi2 signals east of the break-up region are related to a field line resonance phenomenon, probably set up by westward traveling MHD waves originating in the primary source (substorm onset) region. Author (ESA)

N85-24650# York Univ. (England).
PI2 PULSATIONS AND THE SUBSTORM CURRENT WEDGE - GROUND OBSERVATIONS
M. Lester, W. J. Hughes (Boston Univ.), and H. J. Singer (AFGL, Hanscom AFB, Mass.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 673-677 refs (For primary document see N85-24544 14-46)
(Contracts F19628-81-K-003; F19628-84-K-0006; Grant SERC-SGD-07443)
Avail: NTIS HC A99/MF E03

Results obtained by relating Pi2 polarization characteristics to the current wedge location using data from the AFGL Magnetometer Network (54 N corrected geomagnetic latitude) are reviewed. Inside and outside the wedge the horizontal polarization ellipse azimuth exhibits a longitudinal pattern explained by a three-dimensional current system and pointing towards its center. For secondary pulsations in a Pi2 series, the azimuth pattern is displaced relative to the wedge center, suggesting that pre-existing currents affected the determination of the current wedge. The sense of polarization is generally anticlockwise, but there are more examples of clockwise polarization outside the current wedge. Phase differences between stations show westward (eastward) phase propagation dominating west of and inside (east of) the current wedge. Author (ESA)

N85-24651# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
GROUND-SATELLITE OBSERVATIONS OF SUBSTORM RELATED Pi 2 PULSATIONS AND CURRENT SYSTEMS
H. J. Singer, D. J. Knecht, W. J. Hughes (Boston Univ.), C. Gelpi (Boston Univ.), and M. Lester (York Univ., England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 679-683 refs (For primary document see N85-24544 14-46)
(Contracts F19628-81-K-0003; F19628-84-K-0006)
Avail: NTIS HC A99/MF E03

Coordinated analysis of magnetometer data from the AFGL Magnetometer Network and the GEOS 2 and 3 synchronous satellites was used to examine the pulsations and current systems associated with magnetospheric substorms. At the time a Pi 2 is observed on the ground, the magnetic disturbance in space is often localized such that synchronous satellites separated by 30 deg see quite different field signatures. The ground magnetic bay structure was used to locate the substorm current wedge with respect to the network and synchronous satellites. A satellite inside the wedge observes a dipolarization of the field at substorm onset and is more likely to observe magnetic disturbances than a satellite outside the wedge. The AFGL ground observations are

useful for understanding the temporal development of substorms.
Author (ESA)

N85-24652# Newcastle Univ. (Australia).
IMPLICATIONS OF THE GLOBAL APPEARANCE OF PI2 AND PC 3 BURSTS
F. W. Menk and K. D. Cole (La Trobe Univ., Bundoora, Australia) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 685-689 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Examination of 2 yr data shows that Pc 3-4 bursts may occur simultaneously with Pi2 in the night hemisphere and may be associated with fluctuations in the interplanetary magnetic field. It is useful to regard the Pc bursts as analogs of Psc or impulse-associated pulsations. Thus, Pc packets on the dayside and simultaneous Pi2 in the night sector may have a common trigger in broadband hydromagnetic impulses such as may be associated with shock structures in the solar wind plasma. Author (ESA)

N85-24653# Imperial Coll. of Science and Technology, London (England).
HYDROMAGNETIC VORTICES: AN INTERPRETATION FOR DAWNSIDE EVENTS AS ON DECEMBER 11, 1977
D. J. Southwood and M. A. Saunders *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 691-694 refs Sponsored by UK Science and Engineering Research Council and ESA (For primary document see N85-24544 14-46)
(Grant NSF ATH-00523)
Avail: NTIS HC A99/MF E03

Magnetometer, plasma, and energetic particle data for a magnetotail vortex event is discussed. The event seems neither atypical nor uncommon. It is argued that coupling of the Alfven mode to the MHD slow mode is occurring, due to curvature in the background magnetic field. Author (ESA)

N85-24654# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ADVANCES IN MAGNETOSPHERIC PLASMA DIAGNOSIS BY ACTIVE EXPERIMENTS
G. Belmont, P. Canu, J. Etcheto, H. deFeraudy, B. Higel, R. Pottelette, C. Beghin, R. Debrie, P. M. E. Decreau, M. Hamelin et al *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 695-699 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

In-situ plasma diagnosis active wave experiments were flown on International Magnetospheric Study spacecraft: Relaxation Sounding (RS) (GEOS 1 & 2, ISEE-A) and Mutual Impedance (MI) probing (GEOS 1 & 2). The RS excites long lasting plasma resonances occuring very close to the characteristics frequencies fpe, nfce, fuh and fgn. Measurements of the electron density (Ne) and magnetic field strength (Bo) are directly obtained with very good accuracy. The MI measures the intensity versus frequency of waves transmitted between two pairs of electrodes. A fit with a theoretical model of mutual impedance leads to estimated Ne and the electron temperature (Te). All measurements are free of spacecraft-related disturbing effects. Further diagnosis capabilities are available from modeling the fine structure of the received signals (cold and hot densities) and from monitoring refined modes of operation (sampling period/scale of Ne and Bo up to 0.086 sec/300 m in the magnetosphere from GEOS).
Author (ESA)

N85-24655# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
CONTRIBUTION OF RELAXATION SOUNDING EXPERIMENTS TO THE UNDERSTANDING OF MAGNETOSPHERIC PROCESSES
G. Belmont, P. Canu, J. Etcheto, H. deFeraudy, and B. Higel *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 701-704 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Relaxation Sounding (RS) experiments onboard GEOS and ISEE provided a reliable and permanent determination of the plasma density during the whole lives of the spacecraft. Plasmaspheric bulge location and the role of equatorial density in Pc5 events were studied. Accurate determination of the plasma characteristic frequencies and the very good frequency resolution of the receiver were used to investigate banded electron cylotron harmonic waves, and natural waves upstream of the Earth's bow shock. The good time resolution of the RS allowed measurements of fast density variations, for compressible MHD waves and magnetospheric boundaries. Author (ESA)

N85-24656# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France). Lab. de Physique et Chimie de l'Environnement.
CONTRIBUTION OF MUTUAL IMPEDANCE EXPERIMENTS TO THE UNDERSTANDING OF MAGNETOSPHERIC PROCESSES
P. M. E. Decreau, C. Beghin, and M. Parrot *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 705-707 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

The GEOS satellites measured the density and temperature of the electron population in the vicinity of geostationnary orbit, using a mutual impedance experiment, free of spacecraft potential effects. Three main plasma regions are: (1) the bulge region of the plasmasphere; (2) a region of intermediate density, corresponding to magnetic flux tubes in the process of being freshly replenished by the ionospheric source; and (3) a trough of low density in the night and morning sectors, where significant departures from thermal isotropic equilibrium are observed. The evolution of the plasma parameters measured in (1) and (2) gives information on physical processes such as ionospheric refilling, the equatorial convection of thermal plasma, and the heating of the electron population. Author (ESA)

N85-24657# Newcastle Univ. (Australia).
A STRUCTURAL CLASSIFICATION OF GEOMAGNETIC PULSATIONS
F. W. Menk and K. D. Cole (La Trobe Univ., Bundoora, Australia) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 709-713 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

A structural classification of geomagnetic pulsations based on the spectral structure of low and mid-latitude regular daytime pulsation activity is presented and its application to Pc-type pulsations is described. The existence of physically discrete classes of regular pulsations is illustrated. The use of such a classification scheme in obtaining a better understanding of generation processes is indicated. Author (ESA)

N85-24658# Centre National de la Recherche Scientifique, Orleans (France).
THE USE OF THE SPECTRAL MATRIX IN ANALYZING THE PROPAGATION CHARACTERISTICS OF ELECTROMAGNETIC EMISSIONS c32
F. Lefeuvre and M. Parrot *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 715-722 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

Estimations of all or part of the power spectra of the wave field components of an electromagnetic emission, observed on GEOS and ISEE satellites are used to obtain information on the wave field, and to determine the wave distribution function (WDF). Knowledge of 3 X 3 spectral matrix of the magnetic wave field components provides information on the degree of polarization of the wave and on the validity of the plane wave approximation. Full information on the propagation characteristics of a sum of waves, or of random wave fields, is also obtained from the spectral matrix using either multiplane wave models or WDF models.
Author (ESA)

N85-24659# Centre National de la Recherche Scientifique, Orleans (France). Lab. de Physique et Chimie de l'Environnement.

MAGNETOSPHERIC WAVE CHARACTERISTICS DERIVED FROM CROSS-SPECTRAL ANALYSIS

M. Parrot, F. Lefeuvre, and D. Jones (British Antarctic Survey, Cambridge, England) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 723-728 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

Analysis of GEOS correlator data shows that the cross-spectral phase is a better indicator of wave presence than the spectral power. Regions of no apparent signal between VLF chorus elements seen on power spectrograms show up as periods of wave activity when cross-spectral phase is viewed. A study of the variation of cross-spectral phase with frequency and time can yield information on the propagation characteristics of the waves. Results indicate that the power gap observed in VLF signals at half the electron cyclotron frequency is not present in the cross-spectral phase. The latter varies in a consistent manner through the gap. Author (ESA)

N85-24660# Aerospace Corp., Los Angeles, Calif.

THE IMS CONTRIBUTIONS TO THE UNDERSTANDING OF AURORAL PRECIPITATION, TRANSPORT AND PARTICLE SOURCES

J. F. Fennell *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 731-742 refs (For primary document see N85-24544 14-46)

Avail: NTIS HC A99/MF E03

The auroral ionosphere as a source of particles for the magnetosphere and auroral particle acceleration and precipitation is discussed. Processes involved in the transport of particles from the ionosphere into the magnetosphere are treated as well as the precipitation of magnetospheric particles into the auroral and subauroral ionosphere. Effects of auroral ionospheric ions on the magnetospheric plasma composition are described. Results obtained before the International Magnetospheric Study are reviewed. Author (ESA)

N85-24661# Alaska Univ., Fairbanks. Inst. of Geophysics.

THE STRUCTURE, STABILITY, WAVE TRANSMISSION AND ENERGY TRANSFER AT THE EARTH'S MAGNETOPAUSE

L. C. Lee *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 743-750 refs (For primary document see N85-24544 14-46)

(Grant NSF ATM-83-17454)

Avail: NTIS HC A99/MF E03

Progress in the study of the structure, stability, wave transmission and energy transfer processes at the Earth's magnetopause is reviewed. Theoretical models and computer simulation of the rotational and tangential discontinuities are reported. Particle and momentum transport associated with plasma instabilities, such as Kelvin-Helmholtz instability, lower-hybrid-drift instability, and modified two-stream instability, at the magnetopause is considered. Author (ESA)

N85-24662*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

ADVANCES IN MAGNETOSPHERIC PLASMA-WAVE RESEARCH DURING THE IMS

R. R. Anderson *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 751-760 refs (For primary document see N85-24544 14-46)

(Contract NAS5-26819; Grant NGL-16-001-043)

Avail: NTIS HC A99/MF E03 CSCL 04A

Investigations of auroral radiation; terrestrial nonthermal continuum radiation; magnetospheric electrostatic emissions; ELF-VLF wave observations in the ionosphere and magnetosphere; wave-particle interactions; plasma wave propagation; plasma parameters; and ground-based observations of the magnetosphere during the International Magnetospheric Study are summarized. Author (ESA)

N85-24663# OptiMetrics, Inc., Las Cruces, N. Mex.

ANALYSIS OF ATMOSPHERIC INTERFEROMETER DATA Final Report, Jan. 1983 - Jan. 1984

J. A. Dowling, W. O. Gallery, and S. G. OBrien Jul. 1984 215 p (Contract F19628-83-C-0040)

(AD-A150682; OMI-102; AFGL-TR-84-0177) Avail: NTIS HC A10/MF A01 CSCL 20/14

In this study on atmospheric transmission several examples of laser-transmisso-meter-calibrated, high-resolution Fourier transform spectrometer (FTS) measurements were compared with corresponding spectra generated using the FASCOD1C computer model. Experimental data were collected at three coastal sites and one inland site. Measurement path-lengths varied between 4.07 and 6.4 km. Water vapor partial pressures varied between 2.0 and 20.5 torr, partial pressure of water vapor. Of particular interest is the use of the experimental data in comparison to the water vapor continuum absorption infrared model contained in the FASCOD1C computer model. The data were found to agree with FASCODE predictions for the H2O continuum absorption to within the range of uncertainty of the experimental data. The N2 continuum absorption calculated using FASCOD1C appears to be smaller than that observed and this observation is thought to be related to an unmodeled temperature dependence in the N2 continuum absorption. The experimental high-resolution spectra were compared with calculated continuum absorption by selecting 49 discrete frequencies in the 1900 to 3200/cm region which were minimally influenced by discrete line absorption. Corrections for local line and N2 and CO2 continuum absorptions were applied to the experimental data at these 49 frequencies. The data were then compared with H2O continuum absorption coefficients calculated using the FASCOD1C model and the 1982 version of the AFGL atmospheric absorption line compilation. Detailed high-resolution comparisons of experimental data to FASCODE generated spectra show excellent agreement in nearly all features throughout the 1900 to 3200/cm spectral region. GRA

N85-24664# Honeywell Systems and Research Center, Minneapolis, Minn.

POLAR MOTIONS MEASUREMENT STUDY Final Report, May 1983 - Jul. 1984

J. Hanse, W. H. Egli, and M. Ignagni Sep. 1984 122 p (Contract F19628-83-C-0103)

(AD-A150690; Rept-84SRC41; AFGL-TR-84-0261) Avail: NTIS HC A06/MF A01 CSCL 08/5

In this report we analyze the feasibility of subarc-second measurement of Earth crust warp and/or Earth spin axis deviation, in less than one day, using ring laser gyroscopes and accelerometers and/or tiltmeters. It is marginally feasible, using laser gyros equivalent to the Honeywell GG1389, either unidirectionally carouseled or with enhancement equivalent to the Honeywell closed-loop lockin correction (CLIC). Experimental results on the GG1389 show that input axis stability is more than adequate, and that its carouseled or CLIC-enhanced random drift and output resolution suffice marginally. Design and build of a one-axis feasibility demonstrator is recommended, using one CLIC-enhanced GG1389 ring laser gyro, two state-of-the-art tiltmeters, an Ultradex indexer, and a Hewlett-Packard micro-computer. GRA

N85-24665# Systems and Applied Sciences Corp., Vienna, Va.

CHARACTERISTICS AND BEHAVIOR OF ATMOSPHERIC AEROSOLS; APPLICATION TO PREDICTION OF INFRARED EXTINCTION Scientific Report, Jun. 1982 - Jun. 1984

R. F. Wachtmann 25 Jun. 1984 78 p (Contract F19628-81-C-0042)

(AD-A150691; AFGL-TR-84-0154; SR-6) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report describes the characteristics of atmospheric aerosols in terms of their effect on infrared radiation extinction. The aerosol properties are described in terms of the globally uniform background aerosol component and the component of the aerosol that varies on the time scale of hours to a few days. The various atmospheric processes that influence the properties of both components are described, including production, transport

and removal. This report discusses the effect of aerosol chemical composition and atmospheric relative humidity on aerosol physical properties and relates these effects to extinction of near and far infrared radiation. These various aerosol characteristics are related to the aerosol models in the LOWTRAN Atmospheric Transmittance Code. The presence or absence of the sea-salt aerosol is presented as the most important factor influencing the variability in aerosol infrared extinction. This report presents a method of selecting the most appropriate LOWTRAN aerosol model for a given situation. The method is based on airmass history analysis. GRA

N85-24666# Pittsburgh Univ., Pa. Dept. of Physics and Astronomy.
FABRY-PEROT INTERFEROMETER AND SKYMAPPING PHOTOMETER DETERMINATIONS OF MIDLATITUDE f-REGION NEUTRAL WINDS AND TEMPERATURES AND AIRGLOW ENHANCEMENT/DEPLETIONS Final Report, 1 Sep. 1983 - 31 Aug. 1984
M. A. Biondi 26 Oct. 1984 16 p
(Contract F19628-83-K-0036)
(AD-A150730; AFGL-TR-84-0280) Avail: NTIS HC A02/MF A01 CSCL 04/1

A 100 mm aperture, field-widened Fabry-Perot interferometer and a sky-mapping filter photometer were used in support of the IMS F-region chemical release program at Wallops Island, VA. On the night of the successful SF6 release near local midnight (8/9 November 1983) the neutral wind components vz (meridional) and va (zonal), as well as the neutral temperature Tn of the thermosphere were determined from 02 h UT to 06 h UT. Divergence in the zonal flow was noted. No 630.0 nm airflow enhancement/depletion was detected. Keywords include: 630.0 nm airglow, nightglow, interferometry, filter photometer, thermospheric dynamics, thermospheric velocity, thermospheric temperature airglow enhancement. GRA

N85-24667# Air Force Geophysics Lab., Hanscom AFB, Mass.
DETERMINATION OF IONOSPHERIC ELECTRON DENSITY PROFILES FROM SATELLITE UV (ULTRAVIOLET) EMISSION MEASUREMENTS Environmental Research Papers, Feb. 1983 - Feb. 1984
D. J. Strickland, R. E. Daniell, Jr., D. Decker, J. R. Jasperse, and H. C. Carlson 17 May 1984 69 p
(AD-A150734; AFGL-TR-84-0140; AFGL-ERP-880) Avail: NTIS HC A04/MF A01 CSCL 04/1

The possible use of satellite ultraviolet measurements to deduce the ionospheric electron density profile (EDP) on a global basis is discussed. A system concept is considered and analyzed which (1) develops and installs a UV sensor on the DMSP satellite and develops an associated automatic data processing (software) system, (2) utilities optical data together with DMSP electron density and temperature data to deduce the near real-time EDP near the satellite orbital plane, and (3) transmits this EDP data to be used together with ground-based ionosonde data and GPS total electron content data to specify the global EDP for systems users. The ionosonde and total electron content data would increase the EDP data base generated by the UV data and refine the UV based EDP where coincident data existed. This report considers (1) the daytime low to midlatitude ionosphere from 90 to 1000 km, (2) the nighttime midlatitude from about 250 km to 1000km, and (3) the auroral E layer from 90 to about 200 km for undisturbed conditions. The spatial resolution for the daytime and nighttime EDP is at least one vertical profile for each square 500 km on a side and for the auroral E layer at least one vertical profile for each square 50km on a side. Other ionospheric regions were not considered because of frequent occurrence of irregularities or highly variable transport conditions. GRA

N85-24668# Ohio State Univ., Columbus.
A STUDY OF TERRAIN REDUCTIONS, DENSITY ANOMALIES AND GEOPHYSICAL INVERSION METHODS IN GRAVITY FIELD MODELLING
R. Forsberg Apr. 1984 134 p
(Contract F19628-82-K-0022)
(AD-A150788; OSU/DGSS-355; AFGL-TR-84-0174; SR-5) Avail: NTIS HC A07/MF A01 CSCL 08/5

The general principles of the use of known density anomalies for gravity field modelling are reviewed with special emphasis on local applications and utilization of high degree and order spherical harmonic reference fields. The natural extension to include also unknown density anomalies will be studied within the framework of geophysical inversion methods, and the prospects for hybrid gravity field modelling/inversion methods will be outlined. A very simple case of such methods is the determination of representative topographic densities through collocation with parameters.
Author (GRA)

N85-24669# Ohio State Univ., Columbus.
LOCAL COVARIANCE FUNCTIONS AND DENSITY DISTRIBUTIONS
R. Forsberg Jun. 1984 57 p
(Contract F19628-82-K-0022)
(AD-A150792; OSU/DGSS-356; AFGL-TR-84-0214) Avail: NTIS HC A04/MF A01 CSCL 08/5

The relationship between covariance functions and the density anomaly distributions generating the gravity field is studied using the ensemble averaging theorem, yielding interpretations of common well-known covariance functions in terms of simplified statistical mass models. Emphasis is on application for local gravity field modelling (e.g., assuming a high degree-and-order spherical harmonic reference field to be used), within the framework of the planar approximation. The very simple relationship existing between the planar power spectrum and the degree variances are treated in detail, and it is outlined how the shape of the power spectrum may be used as a geophysical inversion tool, to yield depths to density contrast interfaces within the Earth. As a special application of the simple covariance functions associated with statistical mass distributions, it is shown how least-squares collocation may be interpreted as generalized point mass modelling. Finally, formulas are given for practically applicable local multi-layer covariance models (compensated Poisson model), and gravity anomalies in a number of sample areas in the United States are analyzed to yield empirical covariance functions, power spectra and degree-variances. GRA

N85-24670# Tasmania Univ., Hobart (Australia). Dept. of Physics.
THE ACCESS OF ENERGETIC CHARGED PARTICLES TO SATELLITE ALTITUDES Final Report, 1 Aug. 1982 - 30 Jun. 1984
J. E. Humble AFGL Hanscom AFB, Mass. 5 Oct. 1984 39 p
(Grants AF-AFOSR-0313-82; AF-AFOSR-0232-80)
(AD-A150799; AFGL-TR-84-0258) Avail: NTIS HC A03/MF A01 CSCL 04/1

Primary cosmic ray particles are able to arrive at Earth satellites, orbiting at altitudes of only a few hundred kilometers, from zenith angles considerably larger than that of the local horizon. The largest zenith angles at which below horizon access is possible were investigated for a series of satellite altitudes between 400 km and 3600 km. The largest accessible zenith angle found at 400 km is 150 degrees. The angle becomes larger with increasing altitude, reaching 180 degrees (the nadir direction) at 1250 km. Particles arrive at these large zenith angles from a range of westerly directions. At altitudes above 1250 km, particles passing beneath the satellite with their paths curving upwards are able to arrive at large zenith angles from easterly directions. The ranges of zeniths and azimuths involved are altitude dependent. Largest zenith angles of arrival can be interpolated between azimuths, unlimited azimuthal ranges only. These ranges are centered about the azimuth (270 - latitude). The range of reliable interpolation is altitude dependent, becoming larger at higher altitudes. GRA

N85-24671# Rondout Associates, Inc., Stone Ridge, N.Y.
REGIONAL SEISMIC WAVE PROPAGATION Final Technical Report, 1 Oct. 1982 - 30 Sep. 1984
J. A. Carter, L. L. Peseckis, P. W. Pomeroy, and G. H. Sutton 30 Nov. 1984 254 p

(Contract F49620-83-C-0017; ARPA Order 4493; DA Proj. 449-3) (AD-A150801; AFOSR-85-0004TR) Avail: NTIS HC A12/MF A01 CSCL 08/11

Work has involved evaluation of method for using regional seismic waves, particularly Lg for yield determination. The Wake Island hydrophone array digital recording continues to provide high quality data. Polarization and array analyses have been made of Catskill seismic array and regional seismic test network data. For continental models, whole waveform synthetics demonstrate clearly the large dependence of the amplitude and spectral shape on the focal depth and the smaller dependence of these factors on focal mechanism. The broadband digital seismic station, SRNY has been in operation since 16 May 1984. Digital data are recorded on magnetic cartridge tapes each capable of holding 67 Megabytes or 36 hours of data. Many programs are developed for data handling and analysis. GRA

N85-24672# Colorado School of Mines, Golden. Center for Wave Phenomena.

ASYMPTOTIC CONSTRUCTION OF A PROCEDURE FOR PLANE-WAVE SYNTHESIS AND MIGRATION

R. D. Mager Sep. 1984 32 p

(Contract N00014-84-K-0049)

(AD-A150969; AD-E850774; CWP-015) Avail: NTIS HC A03/MF A01 CSCL 08/11

This report outlines the construction of a more exact operator for the migration of plane-wave seismograms. The objective here is to construct a procedure which will produce an output appropriate for both structural imaging and velocity inversion; that is, an output which is a direct indicator of reflection strength. The calculations presented here allow the reflector to have an arbitrary complex two-dimensional shape. While the reflector is assumed to be two-dimensional, the propagating wavefields are assumed to be three dimensional and are responses from point sources. The analysis presented here deals with the case of a constant background velocity field. More general cases are now being examined. GRA

N85-24673# Naval Postgraduate School, Monterey, Calif.

STATISTICAL/TREND ANALYSIS OF THE MARINE ATMOSPHERIC BOUNDARY LAYER MODEL M.S. Thesis

R. D. Bisking Sep. 1984 109 p

(AD-A151053) Avail: NTIS HC A06/MF A01 CSCL 04/1

Transmission and reception of electromagnetic (EM) energy by communications, weapons, and active/passive sensor systems is known to be strongly influenced by an atmospheric phenomena known as ducting, caused by refractive layers in the atmosphere of marine environments. The Naval Postgraduate School (NPS) has developed a Marine Atmospheric Boundary Layer (MABL) model which can be used to predict, over a 24 hour period, the refractive profile of the lower atmosphere. This thesis examines the model from the statistical/trend analysis approach to examine whether the model can be used as a valid predictor of refractive/ducting conditions. GRA

N85-24674# Iowa Univ., Iowa City.

ACTIVE MAGNETOSPHERIC PARTICLE TRACING EXPLORERS (AMPTE) Annual Letter Report, 1 Dec. 1983 - 30 Nov. 1984

R. R. Anderson 7 Feb. 1985 10 p

(Contract N00014-82-K-0183)

(AD-A151072) Avail: NTIS HC A02/MF A01 CSCL 04/1

The primary purposes of the Active Magnetospheric Particle Tracing Explorers (AMPTE) program are (1) to carry out the release and monitoring of lithium and barium ions in the solar wind and within the distant magnetosphere in order to study the access of solar wind ions to the magnetosphere, the convective-diffusive transport and energization of magnetospheric particles, and the instabilities and wave-particle interactions associated with the releases and the subsequent evolution of the injected clouds, and (2) to generate massive releases of barium in the dawn magnetosheath in order to create visible artificial comets in the flowing solar wind plasma within which studies of diamagnetic effects, ionization, momentum exchange, ion transport, and visible phenomena can be made. Complete descriptions of the three spacecraft involved in the AMPTE program, the Charge Composition Explorer (CCE), the Ion Release Module (IRM), and the United Kingdom Subsatellite (UKS) and the experiments on the spacecraft will be included in the May 1985 issue of IEEE Transacations on Geoscience and Remote Sensing. The AMPTE program is a collaborative effort involving the United States, the Federal Republic of Germany, and the United Kingdom. GRA

N85-24675# Sandia Labs., Albuquerque, N. Mex.

SEAFLOOR SEISMIC MEASUREMENTS IN THE SOUTHERN BERING

James P. Hickerson 1984 8 p refs Presented at the Arctic Energy Technol. Workshop, Morgantown, W. Va., 14 Nov. 1984 (Contract DE-AC04-76DP-00789)

(DE85-004908; SAND-84-2192C; CONF-8411108-1) Avail: NTIS HC A02/MF A01

Plans are being made to monitor the earthquake response of seafloor sediments in and near southwestern Alaskan offshore leasing areas. These sites possess high seismicity for which limited data exist. The Sandia Seafloor Earthquake Measurement System (SEMS) would be deployed to collect the necessary data over an eight year time span. A proposal for a joint industry-government project to accomplish this goal has been circulated. DOE

N85-24676# Department of Energy, New York.

HIGH ALTITUDE SAMPLING PROGRAM: RADIOACTIVITY IN THE STRATOSPHERE Environmental Measurements Lab.

R. Leifer, Z. R. Juzdan, and R. Larsen Nov. 1984 198 p

(DE85-005924; EML-434) Avail: NTIS HC A09/MF A01

Radioactivity data are presented from the high altitude sampling program's aircraft (Project Airstream) and balloon (Project Aschan) studies for the years 1981 to 1983. Gross gamma, gamma spectral and radiochemical analyses of filter samples were carried out. Quality control samples and air samples, were analyzed. Inventories for the Northern Hemisphere stratosphere of (137)Cs, (144)Ce, (90)Sr and (239) (240)Pu are included. Based on our measurements made in 1981 and 1982 for (90)Sr, the stratospheric half residence time was found to be 6.5 months, a reduction from the previous value of 10 months. The total stratospheric inventory of (90)Sr for July 1982 (4 kCi) is the lowest since 1963, when inventories were first started. DOE

N85-24677# Physikalisch-Technische Studien G.m.b.H., Freiburg (West Germany).

MEASUREMENTS WITH AN AURORAL SPECTROMETER IN THE ENERGY BUDGET CAMPAIGN Final Report, Dec. 1983

Peter Seidel, Gerhard Schmidtke, and Gerhard Stasek Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 43 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-84-050; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, Federal Republic of West Germany DM 9

A combination of grating spectrometers and photometers with 18 detectors was started twice during the Energy Budget Campaign from Kiruna, Sweden. The optical design of the instrument is described. The extensive calibration requires different techniques for the wavelength ranges from the extreme UV to the visible part of the spectrum. In order to determine the photon fluxes generated by precipitating particles during auroral events, the experiment completely covers the spectral region from 50 to 650 nm, some wavelength channels overlapping. The spectral resolution for the instrument part scanning the shorter wavelengths (50 to 250 nm) is 1 nm and for the other instrument part (105 to 650 nm) is 3 nm. Up to 14 spectra are recorded in each of the wavelength channels for different height regions above 100 km. At the same time, monochromators at 83.4, 98.9, 120.0, and 215 nm and photometers at 130.4, 337.1, 391.4 and 557.7 nm record auroral emissions from ionized and neutral atomic oxygen and molecular nitrogen. Author (ESA)

N85-24678# Cosmos Corp., Washington, D.C.
INNOVATION IN EARTHQUAKE AND NATURAL HAZARDS RESEARCH: DETERMINING SOIL LIQUEFACTION POTENTIAL
G. B. Moore and R. K. Yin Nov. 1984 61 p refs
(Grant NSF CEE-82-03884)
(PB85-149573; ISBN-0-942570-10-3; NSF/CEE-84036; Case-Study-5) Avail: NTIS HC A04/MF A01 CSCL 05A

This case study analyzes how an innovation in earthquake and natural hazards research was used for practical and policy purposes, why utilization occurred, and what potential policy implications can be drawn. The innovation was the dynamic analysis method, used to identify those soils that are likely to liquefy during earthquakes. The research was designed and undertaken by H. Bolton Seed at the University of California at Berkeley during the 1960s. The research was a major breakthrough in engineering research: liquefaction had never before been reproduced in a laboratory. The work yielded quantitative information about the conditions under which liquefaction occurs. These data were then used to develop procedures for predicting liquefaction; eventually the need to test soil samples in the laboratory was eliminated.
GRA

N85-24142# Joint Publications Research Service, Arlington, Va.
INVESTIGATIVE REPORT ON USING GEOLOGICAL RESEARCH TO PROMOTE PROSPECTING
In its China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 17-23 Transl. into ENGLISH from Keyan Guanli (Peking), no. 1, 1984 p 15-18 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

N85-24377# Centre National d'Etudes Spatiales, Toulouse (France). Div. Balloons.
LOCATION AND DATA COLLECTION FOR LONG STRATOSPHERIC BALLOON FLIGHTS
P. Malaterre *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 125-134 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24427# Joint Publications Research Service, Arlington, Va.
RESULTS OF COMPARISON OF LONG-WAVE RADIATION FLUXES MEASURED BY SOVIET AND JAPANESE ACTINOMETRIC RADIOSOUNDS Abstract Only
M. I. Dolgin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 575-580 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24433# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF GRAVITY WAVE ENVELOPE SOLITONS ON SURFACE OF STRATIFIED FLUID INTERACTING WITH WIND Abstract Only
V. V. Petrov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 16 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 438-440 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24434# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELD OF CURRENTS AND ITS USE TO ESTIMATE TOTAL CONDUCTIVITY OF SEDIMENTARY DEPOSITS IN WESTERN BLACK SEA Abstract Only
S. M. Korotayev, S. V. Shabvelyanskiy, I. L. Trofimov, Y. M. Abramov, V. V. Kutkin, S. P. Gaydash, and L. M. Abramova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 17 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 86-94 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24435# Joint Publications Research Service, Arlington, Va.
ABSOLUTE MOVEMENT OF PACIFIC OCEAN PLATE BASED ON PALEOCLIMATIC AND PALEOMAGNETIC DATA AND TRAJECTORY OF HOT SPOTS DURING LAST 120 MILLION YEARS Abstract Only
M. V. Kononov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 17-18 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1442-1445 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24442# Joint Publications Research Service, Arlington, Va.
ENERGY STRUCTURE OF ATMOSPHERIC BOUNDARY LAYER ABOVE WAVES Abstract Only
Y. G. Panchenko and D. V. Chalikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 24 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 834-841 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24450# Joint Publications Research Service, Arlington, Va.
EVALUATING STRUCTURE-FORMING ROLE OF LATE PALEOZOIC AND MESOZOIC-CENOZOIC TECTONIC MOVEMENTS IN BALTIC SEA REGION Abstract Only
N. I. Sviridov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 30 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 794-800 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24451# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF MAGNETICALLY ACTIVE LAYERS OF INDIAN OCEAN DETERMINED FROM DEEP DRILLING DATA AND MAGNETIC SURVEYS Abstract Only
A. A. Shreyder *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 31 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 801-807 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24453# Joint Publications Research Service, Arlington, Va.
SMALL COMPONENT SPECTRAL MODEL OF ANNUAL COURSE OF ZONAL ATMOSPHERIC CIRCULATION Abstract Only
M. B. Galin and S. Y. Kirichkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 33 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 349-355 Original language document announced as 84A-39190 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24458# Joint Publications Research Service, Arlington, Va.
CONVECTIVE INSTABILITY OF HORIZONTAL LAYER OF BINARY MIXTURE Abstract Only
V. V. Kolesov, A. L. Urintsev, and V. I. Yudovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 36 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 444-446 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24459# Joint Publications Research Service, Arlington, Va.
IONSPHERIC EFFECTS OF SEASONAL AND DIURNAL VARIATIONS OF ELECTRIC FIELDS IN EQUATORIAL F-REGION Abstract Only
N. M. Kashchenko and M. A. Nikitin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 36 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 393-397 Original language document annouced as 84A-40083 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24460# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF INTERNAL GRAVITY WAVES ON F LAYER Abstract Only

G. G. Dudebulidze and A. D. Pataraya *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 37 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 398-402 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24461# Joint Publications Research Service, Arlington, Va.
UNIVERSAL TIME EFFECTS IN POLAR IONOSPHERE Abstract Only
N. M. Maksimova and N. K. Osipov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 37 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 403-406 Original language document announced as A84-40085 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24462# Joint Publications Research Service, Arlington, Va.
SPREADING OF GREATLY EXTENDED INHOMOGENEITIES IN UPPER IONSPHERE Abstract Only
N. S. Blaunshteyn and Y. Y. Tsedilina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 38 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 407-413 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24463# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF STRONG INHOMOGENEITIES IN IONOSPHERIC PLASMA, PART 1 Abstract Only
V. A. Rozhanskiy and L. D. Tsendin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 38-39 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 414-419 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24464# Joint Publications Research Service, Arlington, Va.
ANISOPTROPY OF ALFVEN WAVE ABSORPTION IN IONOSPHERE Abstract Only
G. V. Givishvili, L. A. Lobachevskiy, M. V. Fiskina, and A. B. Shvartsburg *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 39 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 429-431 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24465# Joint Publications Research Service, Arlington, Va.
ALTITUDE OF AURORAL SCATTERING OBSERVED ALONG AURORAL ELECTROJETS Abstract Only
Y. Y. Timofeyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 40 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 432-435 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24466# Joint Publications Research Service, Arlington, Va.
CORRELATION OF RING CURRENT AND IONOSPHERIC GAP IN MORNING AND EVENING HOURS Abstract Only
A. S. Besprozvannaya, G. L. Gdalevich, V. D. Ozerov, E. N. Sosnovets, L. V. Tverskaya, and O. V. Khorosheva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 40-41 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 442-447 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24467# Joint Publications Research Service, Arlington, Va.
DISTURBANCES IN STRUCTURE OF LOWER IONOSPHERE AT TERMINATORS BASED ON RESULTS OF WINDE-BAND LW SOUNDING Abstract Only
G. F. Ignatyev and N. K. Osipov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 41 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 496-498 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24475# Joint Publications Research Service, Arlington, Va.
STUDY OF INTEGRAL AND SPECTRAL DIRECT SOLAR RADIATION OVER ATLANTIC Abstract Only
Y. N. Leontyeva and I. N. Plakhina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 46 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 599-605 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24477# Joint Publications Research Service, Arlington, Va.
APPLICABILITY OF VERTICALLY HOMOGENEOUS ATMOSPHERIC MODELS FOR REMOTE SOUNDINGS Abstract Only
S. K. Keevallik and A. G. Kheynlo *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 48 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 827-833 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24480# Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF CURRENT PULSATIONS OF CHARACTERISTICS IN ATMOSPHERE WITH PERIOD OF ABOUT 1.5 HOURS Abstract Only
S. V. Ferronskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 49-50 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 922-928 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24483# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AEROSOL ON FORMATION OF OUTGOING THERMAL RADIATION Abstract Only
Y. M. Timofeyev and S. P. Obraztzov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 51 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 947-956 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24484# Joint Publications Research Service, Arlington, Va.
ONE-DIMENSIONAL NONSTATIONARY MODEL OF PHOTOCHEMICAL TRANSFORMATIONS OF GAS IMPURITIES IN STRATOSPHERE Abstract Only
I. L. Karol and A. A. Kiselev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 52 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 957-968 Original language document announced as 85A-15397 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24486# Joint Publications Research Service, Arlington, Va.
INTERPRETING REFRACTED WAVES METHOD DATA ON BASIS OF AUTOMATED DETERMINATION OF SEISMIC DRIFT Abstract Only
F. M. Lyakhovitskiy and S. A. Shapiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 59 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 36-45 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24489# Joint Publications Research Service, Arlington, Va.
DETERMINING GEOMETRICAL DIVERGENCE USING SEISMIC OBSERVATION DATA Abstract Only
A. G. Averbukh and Y. A. Dyatlovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 63 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 4, Apr. 1984 p 90-93 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24490# Joint Publications Research Service, Arlington, Va.
NEW METHODS FOR INTERPRETING SEISMIC TIME FIELDS

IN MEDIA WITH VARIABLE VELOCITIES Abstract Only
V. B. Piyp *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 65 Transl. into ENGLISH from Vestnik Moskovskogo Univ., Ser. 4: Geol. (USSR), no. 3, May-Jun. 1984 p 83-92 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24492# Joint Publications Research Service, Arlington, Va.
DIAGRAM OF NONSTATIONARY REJOINING OF MAGNETIC FORCE LINES Abstract Only
V. S. Semenov, Y. P. Vasilyev, and A. I. Pudovkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 66-67 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 448-452 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24493# Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATIONS IN TERRESTRIAL MAGNETIC FIELD AND STRUCTURE OF MAGNETOSPHERE Abstract Only
V. I. Afanasyeva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 67 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 460-466 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24494# Joint Publications Research Service, Arlington, Va.
EXCITATION OF GEOMAGNETIC Pci-2 AND PULSATIONS WITH DECREASING PERIOD DURING MICROSUBSTORMS Abstract Only
Y. S. Barkova and S. I. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 68 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 467-471 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24495# Joint Publications Research Service, Arlington, Va.
DIRECTIONAL ANALYSIS OF WAVE PACKETS OF MAGNETO-TELLURIC FIELD Abstract Only
M. G. Savin, Y. G. Izrailskiy, and R. A. Aplakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 68 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 472-475 Original language document announced as 84A-40097 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24496# Joint Publications Research Service, Arlington, Va.
DYNAMIC SPECTRA OF MEAN MONTHLY VALUES OF GEOMAGNETIC FIELD ELEMENTS BASED ON SPECTRAL-TIME ANALYSIS DATA Abstract Only
V. N. Astapenko and Y. N. Kuznetsov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 69 Transl. into ENGLISH from Geomagnetizm i Aeron. (USSR), v. 24, no. 3, May-Jun. 1984 p 476-481 Original language document announced as 84A-40098 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24497# Joint Publications Research Service, Arlington, Va.
LATERAL INHOMOGENEITY OF MANTLE SURFACE IN WESTERN EURASIA Abstract Only
N. Y. Kunin and E. R. Sheykh-Zade *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 69-70 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 21-34 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24498# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF CRUST AND UPPER MANTLE DENSITY BASED ON DEEP SEISMIC SOUNDING AND GRAVIMETRY DATA, PART 1 Abstract Only
V. N. Strakhov and T. V. Romanyuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 71 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 44-63 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24499# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP BETWEEN SEISMIC STATUS OF EARTH AND RELATIVE POSITION OF BODIES IN SUN-EARTH-MOON SYSTEM Abstract Only
N. V. Kulanin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 71 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 6, Jun. 1984 p 95-99 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24501# Joint Publications Research Service, Arlington, Va.
STUDY OF EARTHQUAKE PREPARATION PROCESSES FROM DISTRIBUTION OF WEAK TREMOR EPICENTERS Abstract Only
B. G. Pustovitenko and A. G. Kamenobrodskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 74 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 44-52 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24502# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF REFLECTED WAVE RECORD FORM Abstract Only
Y. A. Galagan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 75 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 52-59 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24503# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF RETRIEVING DYNAMICS OF REFLECTED WAVE METHOD RECORDS BENEATH LOW-VELOCITY ZONE Abstract Only
A. G. Madatov and A. M. Stovas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 75 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 59-71 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24504# Joint Publications Research Service, Arlington, Va.
RESULTS OF STUDIES OF WAVE FIELD INTERNAL STRUCTURE IN PREDICTION OF GEOLOGICAL CROSS SECTION Abstract Only
G. F. Telepnev and V. P. Kovalev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 76-77 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 4, Jul.-Aug. 1984 p 83-88 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24505# Joint Publications Research Service, Arlington, Va.
LOCATION OF CONTINENTAL PERMIAN VOLCANITES OF CENTRAL ASIA AND ITS TECTONIC INTERPRETATION Abstract Only
A. M. Kurchavov and V. V. yarmolyuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 83 Transl. into ENGLISH from Geotektonika (USSR), no. 4, Jul.-Aug. 1984 p 75-89 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24785 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherche de Geodesie Spatiale.
EARTH ROTATION AND POLAR WANDERING [LA ROTATION DE LA TERRE ET LE MOUVEMENT DU POLE]
Richard Biancale *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1093-1116 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24786 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherche de Geodesie Spatiale.
THE MEDOC 2: EXPERIMENTAL DOPPLER MEASUREMENT OF EARTH KINEMATICS [LE PROJET MEDOC 2: MESURE EXPERIMENTALE PAR DOPPLER DE LA CINEMATIQUE TER-

RESTRE]
Alfred Piuzzi *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1117-1148 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-24679 Stanford Univ., Calif.
A STUDY OF THE TURBULENT LAYER IN THE WATER AT AN AIR-WATER INTERFACE Ph.D. Thesis
Tak Kee Cheung 1984 278 p
Avail: Univ. Microfilms Order No. DA8429499

The present experimental program was undertaken with the goal of learning how the energy, which is transferred from the wind, is distributed among the mean, wave, and turbulent flow fields in the water. The interactions between these three flow fields were also examined. The experiments were performed in the Stanford Wind, Water-Wave Research Facility. A two-component, frequency-shifted, laser Doppler anemometer system was used with frequency trackers to measure the water velocity. Three major sets of experiments were done: (1) wind-generated waves in Eulerian coordinates with wind speeds ranging from 1.5 m/s to 13.1 m/s, wind-ruffled mechanically generated waves (22 mm in amplitude and at a frequency of 1 Hz) in Eulerian coordinates with wind speeds ranging from 0.0 to 6.2 m/s, and (3) wind-ruffled mechanically generated waves in wave-following Eulerian coordinates with wind speeds ranging from 0.0 to 6.1 m/s. Dissert. Abstr.

N85-24680*# Oklahoma Univ., Norman. School of Meteorology.
VARIATIONAL MESOSCALE SATELLITE DATA ASSIMILATION AND INITIALIZATION Final Report, 15 Jan. 1983 - 31 Dec. 1984
Yoshi K. Sasaki and James S. Goerss May 1985 73 p refs
(Grant NAG5-289)
(NASA-CR-175704; NAS 1.26:175704) Avail: NTIS HC A04/MF A01 CSCL 04B

The problems of mesoscale satellite data assimilation were examined. Assimilation of satellite data to improve the forecasts made by mesoscale forecast models was undertaken. Assimilation of high resolution satellite derived temperature data into a mesoscale model with horizontal resolution of 50 to 60 km is reported. Unlike global assimilation, in which a small portion of the forecast model domain is subject to data insertion at virtually every time step, the mesoscale assimilation virtually all of the forecast model domain is subject to data insertion at one time step. The mesoscale problem lends itself naturally to intermittent data assimilation and the forecast model is reinitialized whenever a new satellite pass covers its domain with data. The satellite data assimilation as an initialization problem are discussed. E.A.K.

N85-24681# Air Force Geophysics Lab., Hanscom AFB, Mass.
RAIN RATE DETERMINATIONS FROM ELECTRONIC WEIGHT MEASUREMENTS: INSTRUMENT DESCRIPTION AND DATA REDUCTION TECHNIQUES Instrumentation Papers, 1982 - 1984
R. O. Berthel and A. J. Matthews 9 Aug. 1984 23 p
(AD-A150765; AFGL-TR-84-0212; AFGL-IP-324) Avail: NTIS HC A02/MF A01 CSCL 04/2

Attenuation of electromagnetic radiation by rain may pose problems in the operation of many of the existing or proposed military surveillance, weapon guidance, and communications systems. The evaluation and/or calibration of such systems may be possible with a high-resolution rain rate meter. The Air Force Geophysics Lab. has designed and constructed a prototype instrument for the derivation of rain rate from electronic measurements of collected water. This device gives 30-s averaged-rate-values every 3 s and produces rain rate records that show a detailed structure of the rainfall variability. Since this measuring concept does not require a particular weight or volume of collected water before a reading, it is a considerable improvement over the rain measuring instruments currently in general use. This report describes the prototype instrument and specifies the data reduction techniques that have been devised for this particular rain-measuring concept. The information contained should enable others to construct similar devices and avoid some of the problems that plagued our initial efforts. Consideration of the recommendations made in this report may result in more efficient instruments and/or better methods of data reduction. GRA

N85-24682# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
AN INTRODUCTION TO USAFETAC (USAF ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER)
P. J. Breitling 1 Nov. 1984 26 p
(AD-A150971; AD-E850774; USAFETAC-P-105-3) Avail: NTIS HC A03/MF A01 CSCL 04/2

This pamphlet informs potential users about some of the products and support available at USAFETAC. It is a concise overview aimed at those unfamiliar with ETAC's capabilities. Projects and products are briefly described and services and responsiveness outlined. GRA

N85-24683# Army Research Inst. of Environmental Medicine, Natick, Mass.
BIOPHYSICAL EVALUATION OF THE WET GLOBE TEMPERATURE INDEX (BOTSBALL) AT HIGH AIR MOVEMENTS AND CONSTANT DEW POINT TEMPERATURE
R. R. Gonzalez, G. N. Sexton, and K. B. Pandolf Feb. 1985 23 p
(DA Proj. 3E1-62777-A-878)
(AD-A151065; USARIEM-M-19/85) Avail: NTIS HC A02/MF A01 CSCL 04/2

A study was conducted to verify whether high temperatures (from 41 degrees C to 54 degrees C) (normal lighting) at different wind movements (up to 9 m.s-1) at constant dew points affect the wet globe temperature index measured with a Botsball. A new meter (Reuter-Stokes) was also tested which digitizes the values of globe temperature, air and wet bulb (ventilated) temperatures. The values are integrated to a wet bulb globe temperature 8WBGT). The reading from this meter, as well as the Botsball, were tested against a Yellow Springs Instrument (USI) standard set-up for natural wet bulb, air and globe temperatures, and against psychrometric values. All data were collected on-line by a computer in an all-weather tropic/wind chamber and procedures were designed according to standard practices (ASHRAE Fundamentals). The data were subjected to statistical analysis, reversing the order in which one index was the dependent or independent variable. A multiple correlation analysis was also done in which the Reuter-Stokes (R-S) WBGT< YSI WBGT and Botsball readings were the dependent variables versus psychrometric readings of ambient air temperature and ambient water vapor pressure. GRA

N85-24684# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS OF INTERACTIVE TRANSPORT AND SCAVENGING OF SMOKE ON THE CALCULATED TEMPERATURE CHANGE RESULTING FROM LARGE AMOUNTS OF SMOKE
Michael C. MacCracken and J. J. Walton Dec. 1984 22 p refs Presented at the 4th Intern. Conf. on Nucl. War, Erice, Italy, 19-24 Aug. 1984; sponsored by the Ettore Majorana Centre for Scientific Culture
(Contract W-7405-eng-48)
(DE85-006450; UCRL-91446; CONF-8408122-2) Avail: NTIS HC A02/MF A01

Numerical models show that substantial land-surface cooling occurs if very large amounts of highly absorbing sooty-particles

are injected high into the troposphere and spread instantaneously around the hemisphere. The two-layer, three-dimensional general circulation model (GCM) was coupled to the three-dimensional GRANTOUR trace species model. The GCM simulation includes treatment of tropospheric dynamics and thermodynamics and the effect of soot on solar radiation. GRANTOUR simulation includes treatment of particle transport and scavenging by precipitation. The climatic effects of 150 Tg and of 15 Tg of smoke from urban fires over North America and Eurasia are considered. Starting with a perpetual July atmospheric situation, calculation of the climatic effects as 1540 Tg of smoke are spread slowly by the winds, rather than instantaneously dispersed which leads to some regions of greater cooling under the denser parts of the smoke plumes and some regions of less severe cooling where smoke arrival is delayed. Mid-latitude decreases of land surface air temperature for the 150 Tg injection, however, cooling of more than several degrees centigrade only occurs in limited regions under the dense smoke plumes present in the first few weeks after the injection.
DOE

N85-24685# Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologisch Onderzoek.
CABAUW (NETHERLANDS) METEOROLOGICAL DATA TAPES 1973-1984: DESCRIPTION OF INSTRUMENTATION AND DATA PROCESSING FOR CONTINUOUS MEASUREMENTS
H. R. A. Wessels 1984 31 p refs
(KNMI-WR-84-6; B8477104; ISSN-0169-1651) Avail: NTIS HC A03/MF A01

Meteorological data tapes, instrumentation, and data processing are described. Profile measurement data, micrometeorological data, radiation measurement data, and derived quantities are treated. Five tapes were compiled, each containing half-hourly averages of the continuous measurement at the Cabauw (Holland) field site, together with supplementary data from surrounding observation stations. These tapes are intended for meteorological and environmental studies. Guidelines for the user of these data are presented. Author (ESA)

N85-24686# Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologisch Onderzoek.
WIND OBSERVATION STATION DESCRIPTION FOR DEN HELDER (PERIOD 1843-1972) AND DE KOOY (PERIOD 1955-1980)
B. Oemraw 1984 117 p refs In DUTCH; ENGLISH summary (KNMI-TR-42; B8477107) Avail: NTIS HC A06/MF A01

Wind measurement data from Dutch synoptic weather stations Den Helder and De Kooy were evaluated. After correction of systematic and calibration errors, the Den Helder series of hourly wind data from 13 July 1922 until 31 December 1971 is reliable and homogeneous. Summary tables of hourly-average wind are given for this series, with all tabulated data objectively corrected for minor sheltering effects. Similar tables of potential average wind speed data are given for De Kooy over the period 1973-1979. The tables cover the diurnal and annual course, various frequency distributions, and for each 2-month season, the largest observed values of hourly-average wind speed per 30 deg azimuth sector. Author (ESA)

N85-24687# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR MID-DECEMBER 1984 MID-JANUARY 1985, VOLUME 38, NUMBER 24, 14 DECEMBER 1984
14 Dec. 1984 10 p refs
Avail: NTIS HC A02/MF A01 CSCL 04B

The report contains weather maps which gives the numerical probability estimates for seasonal temperature and precipitation in North America. Author

N85-24688# National Oceanic and Atmospheric Administration, Princeton, N.J. Fluid Dynamics Lab.
CIRCULATION STATISTICS BASED ON FGGE (FIRST GARP GLOBAL EXPERIMENT) LEVEL 3-B ANALYSES PRODUCED BY GFDL (GEOPHYSICS FLUID DYNAMICS LABORATORY)
N. C. Lau Aug. 1984 438 p refs
(PB85-149318; NOAA-DR-ERL-GFDL-5) Avail: NTIS HC A19/MF A01 CSCL 04B

In this data report are presented the global distributions of selected atmospheric circulation statistics for individual months and seasons during the FGGE year (First GARP Global Experiment; December 1978 through November 1979). These statistics are compiled using the twice-daily Level III-B analyses produced by GFDL (Geophysical Fluid Dynamics Laboratory). The quantities computed include time averages as well as temporal variances and covariances. The spatial patterns of these statistics are plotted on both polar stereographic and Mercator maps. Latitude-pressure distributions of zonally averaged quantities are also depicted using meridional cross-sections. These data reports also contain daily global maps of geopotential height and streamlines for the entire FGGE year. Author (GRA)

N85-23731*# Delta Air Lines, Inc., Atlanta, Ga. Weather Analysis.
AIRLINE METEOROLOGICAL REQUIREMENTS
C. L. Chandler and John Pappas (Western Airlines) *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 17-18 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23732*# Newton (Dennis W.), Reno, Nev.
GENERAL AVIATION'S METEOROLOGICAL REQUIREMENTS
Dennis Newton *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 19-27 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23733*# Business and Commercial Aviation, White Plains, N.Y.
CORPORATE/COMMUTER AIRLINES METEOROLOGICAL REQUIREMENTS
John W. Olcott *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 23-25 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23737*# Naval Research Lab., Washington, D. C. Experimental Cloud Physics Section.
A NEW CHARACTERIZATION OF THE ICING ENVIRONMENT BELOW 10,000 FEET AGL FROM 7,000 MILES OF MEASUREMENTS IN SUPERCOOLED CLOUDS
Richard K. Jeck *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 44-47 refs (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23738*# Federal Aviation Administration, Atlantic City, N.J.
A NEW CHARACTERIZATION OF SUPERCOOLED CLOUDS BELOW 10,000 FEET AGL
Charles O. Masters *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 49-52 refs (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23740*# Flying Tigers-Retired, San Pedro, Calif.
DEVELOPMENT OF A WIND SHEAR PERFORMANCE ENVELOPE
John H. Bliss *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 55-57 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23742*# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
A MODEL OF A DOWNBURST; A WIND TUNNEL PROGRAM ON PLANETARY BOUNDARY LAYER; AND AIRSHIP IN TURBULENCE
Bernard Etkin *In* NASA. Marshall Space Flight Center Proc.: 7th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Apr. 1984 p 61-66 (For primary document see N85-23729 14-03)
Avail: NTIS HC A07/MF A01 CSCL 04B

N85-23875# Danish Meteorological Inst., Copenhagen.
APPLICATIONS OF ARGOS DATA COLLECTION SYSTEMS IN ARCTIC REGIONS
Flemming Jensen *In* CNES Data Collection and Platform Location by Satellite 1980 12 p (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23876# Ecole Polytechnique, Palaiseau (France). Lab. de Meteorologique Dynamique.
THE BALSAMINE EXPERIMENT
D. Cadet, H. Ovarlez, and G. Sommeria *In* CNES Data Collection and Platform Location by Satellite 1980 15 p refs Sponsored by CNES and Delegation Generale a la Recherche Scientifique et Technique (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23877# Tetra Tech, Inc., Pasadena, Calif.
MOUNTAIN BARRIER BAROCLINITY EFFECTS ON SURFACE WINDS ALONG THE ALASKAN ARCTIC COAST
Thomas L. Kozo *In* CNES Data Collection and Platform Location by Satellite 1980 11 p refs Sponsored by NOAA (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23892# Swedish Space Corp., Solna.
THE EXPERIENCE OF THE SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE (SMHI) WITH THE ARGOS SYSTEM
Thomas Thompson *In* CNES Data Collection and Platform Location by Satellite 1981 10 p (For primary document see N85-23883 14-15)
(PM-U1/81) Avail: NTIS HC A05/MF A01

N85-23893# Danish Meteorological Inst., Copenhagen.
APPLICATIONS OF ARGOS DATA COLLECTION SYSTEM FOR AUTOMATIC METEOROLOGICAL OBSERVATORIES IN ARCTIC REGIONS
Flemming Jensen *In* CNES Data Collection and Platform Location by Satellite 1981 17 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-24360# Wisconsin Univ., Madison. Dept. of Meteorology.
AUTOMATIC WEATHER STATIONS IN ANTARCTICA
Michael L. Savage, Charles R. Stearns, and C. Teague (Stanford University, California) *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 10 p refs Sponsored by NSF (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24361# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
THE 1981 TRANSATLANTIC BOAT RACE CONTRIBUTION FOR MARINE METEOROLOGICAL MEASUREMENTS
R. Rolland *In its* Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24362# Department of Environment, Ottawa (Ontario). Atmospheric Environment Services.
THE DEVELOPMENT OF AN AUTOMATED MARINE METEOROLOGICAL DATA SYSTEM
R. Vockeroth *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 8 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24373# National Oceanic and Atmospheric Administration, Washington, D. C. Special Research Programs Office.
A LARGE-SCALE AIR SEA INTERACTION PROJECT OVER THE PACIFIC BASIN
Rex J. Fleming *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 67-84 refs (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24374# Direction de la Meteorologie Nationale, Magny les Hameaux (France). Etablissement d'Etudes et de Recherches Meteorologiques.
METEOROLOGICAL BUOYS DEVELOPED AT THE EERM LABORATORY
Vladislav Klaus *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 85-99 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24375# Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie et Geophysique de l'Environnement.
ATMOSPHERE ICE-OCEAN INTERACTIONS IN THE ANTARCTIC (IAGO)
A. Poggi, D. Delaunay, H. Hallot (Ecole Nationale de la Meteorologie), and G. Wendler (Alaska Univ., Fairbanks) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 101-111 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24387# Groenlands Tekniske Organisation (Denmark).
HYDROLOGY AND CLIMATIC CONDITIONS IN GREENLAND
N. V. Soerensen *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 201-207 (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24396# National Data Buoy Center, Bay Saint Louis, Miss.
DRIFTING BUOY STUDIES FOR WEATHER APPLICATIONS
Edmund G. Kerut *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24397# Wisconsin Univ., Madison. Dept. of Meteorology.
ANTARCTIC AUTOMATIC WEATHER STATIONS
Charles R. Stearns *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 16 p refs (For primary document see N85-24391 14-42)
(Grant NSF DPP-79-25040)
Avail: NTIS HC A10/MF A01

N85-24398# Atmospheric Environment Service, Toronto (Ontario).
COLLECTING METEOROLOGICAL REPORTS WITH THE ARGOS SYSTEM
R. Vockeroth and C. diCenzo *In* CNES Data Collection and Platform Location by Satellite: ARGOS User's Conf. 1982 12 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24399# Centre National pour l'Exploitation des Oceans, Paris (France).
THE FRENCH OCEAN CLIMATE IN EQUATORIAL ATLANTIC (FOCAL) DRIFTER PROGRAM, 1983-1984
J. Gonella, M. Fieux, A. Kartavtseff, G. Reverdin, C. Colin (ORSTOM), and Y. DuPenhoat (ORSTOM) *In* CNES Data

Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 11 p refs Sponsored by Centre National pour l'Exploitation des Oceans and French Programme National pour l'Etude du Climat (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24411# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Climatic and Atmospheric Research.
THE TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAM (TOGA)
J. M. Hall *In* CNES Data Collection and Platform Location by Satellite 1984 35 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24414# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
APPLICATIONS OF ARGOS MEASUREMENTS IN EQUATORIAL PACIFIC OCEAN-ATMOSPHERE INTERACTION STUDIES
H. P. Freitag, D. Halpern, and A. Shepherd *In* CNES Data Collection and Platform Location by Satellite 1984 13 p refs Sponsored by NOAA (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24423# National Data Buoy Center, Bay Saint Louis, Miss.
TACTICAL DEPLOYMENT OF SATELLITE-REPORTING DRIFTING DATA BUOYS FOR ENVIRONMENTAL DATA ACQUISITION
R. M. Partridge and J. J. Shimkus (Weather Reconnaissance Squadron (815th), Kessler, Miss.) *In* CNES Data Collection and Platform Location by Satellite 1984 16 p ARGOS Users' Conf., 21-23 May 1984 1984 16 p refs (For primary document see N85-24409 14-47)
Avail: NTIS HC A14/MF A01

N85-24429# Joint Publications Research Service, Arlington, Va.
LYAPUNOV STABILITY OF VERY SIMPLE STEADY SOLUTIONS OF PROGNOSTIC SYSTEMS Abstract Only
V. A. Gordin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 8 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 356-363 Original language document announced as A84-39191 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24430# Joint Publications Research Service, Arlington, Va.
POSSIBLE MULTIPLE ATMOSPHERIC THERMAL MODES WITH TIME SCALE ON ORDER OF ONE MONTH Abstract Only
V. K. Petukhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 8 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 456-468 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24431# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF INTERACTION BETWEEN OCEAN AND ATMOSPHERE ON INTENSITY OF MOVING TROPICAL CYCLONE Abstract Only
G. G. Sutyrin and A. P. Khain *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 9 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 787-794 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24439# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF BUBBLES FORMED UPON BREAKING OF WAVES ON GAS EXCHANGE BETWEEN OCEAN AND ATMOSPHERE Abstract Only
V. V. Alekseyev and A. O. Kokorin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 21-22 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 7, Jul. 1984 p 606-613 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24440# Joint Publications Research Service, Arlington, Va.
CONSIDERING ZONAL WIND IN SEMIDIURNAL TIDE PROBLEM Abstract Only
O. V. Kaydalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 22 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 907-914 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24443# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF COLD FILM IN WATER-AIR BOUNDARY LAYER Abstract Only
Y. P. Anisimova, Y. N. Belov, and A. A. Speranskaya *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 24-25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 848-853 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24454# Joint Publications Research Service, Arlington, Va.
PARAMETERIZATION OF APPARENT AND LATENT HEAT FLUXES ABOVE WATER SURFACE IN CALM WEATHER UNDER NATURAL CONDITIONS Abstract Only
A. A. Grachev and G. N. Panin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 364-371 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24455# Joint Publications Research Service, Arlington, Va.
MEAN FREE PATH LENGHT OF PHOTONS WITH BROKEN CLOUD COVER Abstract Only
V. N. Skorinov and G. A. Titov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 372-378 Original language document announced as 84A-39392 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24456# Joint Publications Research Service, Arlington, Va.
CHEMICAL COMPOSITION OF COASTAL HAZE AEROSOL Abstract Only
Y. A. Pkhalagov and T. G. Cherkasova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 388-393 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24457# Joint Publications Research Service, Arlington, Va.
ERROR IN LASER CORRELATION WIND SPEED METERS RESULTING FROM VARIABLE ATMOSPHERIC TRANSPARENCY Abstract Only
G. G. Matviyenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 440-443 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24470# Joint Publications Research Service, Arlington, Va.
LONG NONLINEAR WAVES IN LAYERS OF SUDDEN CHANGES IN WIND VELOCITY Abstract Only
N. N. Romanova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 42-43 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 469-475 Original language document announced as 84A-42544 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24471# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL RESULTS OF TEMPERATURE-WIND SOUNDINGS OF THE ATMOSPHERE BY THE RADIO ACOUSTICAL

METHOD Abstract Only
S. I. Babkin, Y. G. Proshkin, and Y. N. Ulyanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 43-44 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 495-500 Original language document announced as 84A-42546 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24472# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TOTAL MOISTURE CONTENT IN CLOUD-FREE ATMOSPHERE BY RELATIVE RADIO EMISSION MEASUREMENTS Abstract Only
V. I. Aleshin, V. M. Piechkov, and T. Y. Barkan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 44 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 6, Jun. 1984 p 501-504 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24476# Joint Publications Research Service, Arlington, Va.
MODELING OF RADIOTHERMAL RADIATION OF RAIN BY MONTE-CARLO METHOD Abstract Only
M. T. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 47 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 820-826 Original language document announced as 84A-13803 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-24689*# Wisconsin Univ., Madison. Space Science and Engineering Center.
SEA SURFACE TEMPERATURES FROM VAS MSI DATA Final Report
John J. Bates 31 May 1984 13 p refs Prepared for JPL
(Contract JPL-956477; Grant NSF ATM-82-05386)
(NASA-CR-175706; JPL-9950-1011; NAS 1.26:175706) Avail: NTIS HC A02/MF A01 CSCL 08J

A procedure is developed for estimating sea surface temperatures from multispectral image data acquired from the VISSR atmospheric sounder on the geostationary GOES satellites. Theoretical regression equations for two and three infrared window channels are empirically tuned using clear field of view satellite radiances matched with reports of SST from NOAA fixed environmental buoys. The empirical regression equations are then used to produce daily regional analyses of SST. Monthly mean SST's for the western North Atlantic and the eastern equatorial Pacific during March and July 1982 were produced for use in the SST Intercomparison Workshop Series. Workshop results showed VAS SST's have a scatter of 0.8-1.0 C and a slight warm bias with respect to the other measurements of SST. The VAS SST's show no discernible bias in the region of El Chichon volcanic aerosol cloud. Author

N85-24690# Naval Postgraduate School, Monterey, Calif.
SENSITIVITY ANALYSIS OF A COUPLED ATMOSPHERIC-OCEANIC BOUNDARY LAYER MODEL M.S. Thesis
R. V. Hervey Jun. 1984 64 p
(AD-A150760) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this thesis, a coupled atmospheric-oceanic boundary layer model which provides a single station assessment and prediction capability has been developed from independently formulated one-dimensional oceanic and atmospheric bulk boundary layer models. Sensitivity analyses were conducted to determine major differences in the response of the coupled model compared to those of the separate oceanic and atmospheric models. The general behavior of the coupled model is not significantly different from that of the atmospheric model alone over short term simulations (12 to 24 hours). However, under a certain set of limited conditions where winds are light and the lifting condensation level is close to the height of the inversion, large differences may occur. Major differences between the predicted evolution of the ocean boundary layer by the ocean model and coupled model are more common, and the short term predictive ability of the ocean model in coupled form is enhanced. GRA

N85-24691# Naval Postgraduate School, Monterey, Calif.
OBSERVATIONS OF THE CALIFORNIA COUNTERCURRENT M.S. Thesis
R. L. Harrod Jun. 1984 148 p
(AD-A150781) Avail: NTIS HC A07/MF A01 CSCL 08/3

This thesis describes results from moored current meters, 150-350 m, for a region over the continental slope off Cape San Martin, California, from January 1979 to April 1980. Current vector time series were constructed from the data and compared to a local coastal upwelling index. Progressive vector diagrams were also constructed, and spectrum analysis was performed for alongshore and cross-slope currents. The California Countercurrent was found to be present in the study area during the entire period. Seasonally, the countercurrent was substantially stronger during the spring. Frequent current reversals and oscillations occurred between equatorward and poleward flow, less often at the nearshore station. Preferred low frequency energy peaks were found at periods of about 10 days. The intensity of the countercurrent increased with increasing coastal upwelling index, and the cross-slope flow also appeared to be related to the local coastal upwelling index. GRA

N85-24692# Woods Hole Oceanographic Institution, Mass.
SOME PRELIMINARY RESULTS CONCERNING DEEP NORTHERN-BOUNDARY CURRENTS IN THE NORTH PACIFIC
B. A. Warren and W. B. Owens 1985 16 p Repr. from Prog. Oceanog., v. 14, 1985 p 537-551
(Contracts N00014-79-C-0071; N00014-82-C-0019)
(AD-A151021; WHOI-CONTRIB-5484) Avail: NTIS HC A02/MF A01 CSCL 08/3

Fourteen-month velocity records from five moorings along Long. 175 W, in combination with CTD and nutrient data, distinguish two pronounced, quite steady, deep zonal currents near the northern margin of the North Pacific. One flows westward at speeds of 1-3 cm/s along the slope of the Aleutian Island Arc, and appears to be the northern-boundary current required by deep circulation theory. The other flows eastward at about 1-2 cm/s just to the south above the Aleutian Trench and upper Aleutian Rise, and carries water that is slightly lower in temperature and dissolved silica, and slightly higher in salinity and dissolved oxygen, than that to the north or south. We believe that this eastward jet represents an extreme distortion of a level-bottom, interior flow pattern, as forced by the meridional variation in bottom slope on the southern flank of the Aleutian Rise, which imposes a varying effective beta on the system. A simple model of this effect is discussed. GRA

N85-24693# Rome Univ. (Italy). Dipt. di Fisica.
PRELIMINARY REPORT ON THE RESULTS OF HYDROLOGICAL MEASUREMENTS IN THE SOUTHERN TYRRHENIAN SEA, IN THE MESSINA STRAIT AND IN THE WESTERN IONIAN SEA [RAPPORTO PRELIMINARE SUI RISULTATI DELLE MISURE IDROLOGICHE ESEGUITE NEL TIRRENO MERIDIONALE, NELLO STRETTO DI MESSINA E NELLO IONIO OCCIDENTALE]
Francesco Bignami, Adolfo Cipelli, Bruno Cittarelli, Cosima Luigia DiMaggio, Alcide DiSarra, Paolo Grigioni, Giuseppe Guardiani, GianLuigi Liberti, Andrea Pace, Manuela Palelli et al 15 Jan. 1985 62 p In ITALIAN Submitted for publication Prepared in cooperation with CNR Rome
(PREPRINT-433) Avail: NTIS HC A04/MF A01

The data collected by hydrographic stations and oceanographic ships in the Mediterranean are presented. The instruments used

include a fish finder chromoscope, a multisounding depth sounder and vertical profile measurement systems for temperature and salinity. Author (ESA)

N85-24432# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TEMPERATURE AND DEGREE OF ROUGHNESS OF SEA AND LAND SURFACES BY MICROWAVE RADIOMETRIC POLARIZATION MEASUREMENTS Abstract Only
V. V. Bogorodskiy, A. I. Kozlov, and Y. K. Shestopalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 16 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 5, May 1984 p 431-437 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24436# Joint Publications Research Service, Arlington, Va.
ONE PHYSICAL MECHANISM OF FORMATION OF FINE STRUCTURE OF OCEAN WATERS Abstract Only
A. M. Kudin and T. O. Abramyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 18 Transl. into ENGLISH from Dokl. Akad Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1464-1466 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24437# Joint Publications Research Service, Arlington, Va.
DYNAMIC STOCHASTIC MODEL OF LONG-PERIOD VARIABILITY OF OCEAN SURFACE TEMPERATURE Abstract Only
L. I. Piterbarg and A. G. Ostrovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 19 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1467-1470 Original language document announced as A84-43933 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24438# Joint Publications Research Service, Arlington, Va.
TWO-CYCLE MECHANISM OF DISSIPATION OF TIDAL ENERGY IN OCEAN Abstract Only
A. B. Rabinovich and G. V. Shevchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 19 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 276, no. 6, Jun. 1984 p 1470-1473 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24441# Joint Publications Research Service, Arlington, Va.
LOW-FREQUENCY OSCILLATIONS OF SEA LEVEL AND GROUP STRUCTURE OF WIND WAVES Abstract Only
V. V. Yefimov and Y. P. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 23 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 985-994 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24444# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY WIND WAVE SPECTRUM IN STORM BASIN Abstract Only
I. A. Leykin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 25 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 9, Sep. 1984 p 861-866 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24445# Joint Publications Research Service, Arlington, Va.
FRONTAL NATURE OF CROMWELL CURRENT Abstract Only
V. T. Paka and K. N. Fedorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 26 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 725-731 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24446# Joint Publications Research Service, Arlington, Va.
LOCAL MECHANISM OF EQUATORIAL COUNTERCURRENTS Abstract Only
E. N. Mikhaylova, S. K. Popov, and N. B. Shipiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 26-27 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 732-736 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24447# Joint Publications Research Service, Arlington, Va.
MODELING EVOLUTION OF UNSTABLE GEOSTROPIC EDDIES IN BAROTROPIC OCEAN Abstract Only
V. F. Kozlov and V. G. Makarov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 27 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 737-743 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24449# Joint Publications Research Service, Arlington, Va.
REPRESENTATION OF TEMPERATURE AND SALINITY FIELDS USING STATISTICALLYT ORTHOGONAL FUNCTIONS (IN EXAMPLE OF POLYMODE DATA) Abstract Only
Y. B. Fliyushkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 28-29 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 756-763 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24452# Joint Publications Research Service, Arlington, Va.
AUTOMATION OF RADIOMETRIC MEASUREMENTS IN NUCLEAR OCEANOLOGY Abstract Only
K. V. Grinberg, V. M. Kuptsov, V. A. Liskin, and L. S. Sitnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 31-32 Transl. into ENGLISH from Okeanologiya (USSR), v. 24, no. 5, Sep.-Oct. 1984 p 843-848 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24491# Joint Publications Research Service, Arlington, Va.
MOST IMPORTANT GEOCHEMICAL BARRIER ZONES IN OCEAN (WITH EXAMPLE OF ATLANTIC OCEAN BASIN) Abstract Only
Y. M. Yemelyanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 66 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geograficheskaya (USSR), no. 3, May-Jun. 1984 p 39-53 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-23874# Atmospheric Environment Service, Downsview (Ontario).
PROJECT PAPA: THE INTEGRATION OF DRIFTING BUOY DATA INTO AN OPERATIONAL METEOROLOGICAL SERVICE
Denis A. Bourque *In* CNES Data Collection and Platform Location by Satellite 1980 5 p ref (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23878# Dome Petroleum Ltd., Calgary (Alberta).
DATA COLLECTION AND WINTER ICE DYNAMICS IN THE BEAUFORT SEA
R. D. Hoare, H. B. Mercer, and S. dePaoli *In* CNES Data Collection and Platform Location by Satellite 1980 15 p ref (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23879# National Research Inst. of Fisheries, Lisbon (Portugal).
AUTOMATIC BUOYS TO ASSIST THE TUNA FISHERY OFF THE AZORES
Gabriel Lobo Fialho and V. R. P. Barros *In* CNES Data Collection and Platform Location by Satellite 1980 11 p (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

N85-23887# Continental Shelf Inst., Trondheim (Norway).
OPERATIONAL EXPERIENCES WITH THE ARGOS SYSTEM IN

OCEANOGRAPHY AND OIL SPILL EMERGENCY PLANNING. FUTURE PLANS FOR THE USE OF THE ARGOS SYSTEM AS A COMPONENT IN OFFSHORE DATA COLLECTION SYSTEM
Bjorn A. Fossum and Tore Audunson *In* CNES Data Collection and Platform Location by Satellite 1981 7 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-23888# Kiel Univ. (West Germany).
CIRCULATION PATTERN OF THE NORTH ATLANTIC, PART OF THE WARMWATER SPHERE RESEARCH EFFORT AT KIEL UNIVERSITY
Wolfgang Krauss and J. Meincke *In* CNES Data Collection and Platform Location by Satellite 1981 10 p refs (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-23889# Dundee Univ. (Scotland). Physics Lab.
PROPOSED USE OF SYSTEM ARGOS WITH DATA BUOYS FOR CALIBRATION OF THERMAL INFRARED IMAGERY OF NORTH BRITISH WATERS FOR SEA SURFACE TEMPERATURE MAPS
Arthur P. Cracknell and S. M. Singh *In* CNES Data Collection and Platform Location by Satellite 1981 8 p refs (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-23890# Iceberg Transport International Ltd. (France). Icebergs for the Future.
THE USE OF THE ARGOS SYSTEM FOR THE STUDY OF THE DRIFT OF ANTARCTIC ICEBERGS
Francois Mauviel and Marc Dhalluin *In* CNES Data Collection and Platform Location by Satellite 1981 9 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-23891# Norwegian Meteorological Inst., Blindern.
SOME EXPERIENCE FROM ARGOS STATIONS IN THE OPEN SEA
Carl Kolderup Jensen *In* CNES Data Collection and Platform Location by Satellite 1981 6 p (For primary document see N85-23883 14-15)
Avail: NTIS HC A05/MF A01

N85-24350# Polar Research Lab., Inc., Santa Barbara, Calif.
NEW DIRECTIONS IN ARGOS INSTRUMENTATION AT POLAR RESEARCH LAB (PRL)
Walter P. Brown and John Anderson *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 15 p refs (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24351# Bristol Aerospace, Ltd., Winnipeg (Manitoba).
FOURIER TRANSFORM OF WAVE DATA ON ARGOS BUOYS
W. R. Whitehead *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24354# Scripps Institution of Oceanography, La Jolla, Calif. Inst. of Oceanography.
SURFACE CURRENTS IN THE TROPICAL PACIFIC DURING 1979-1980 USING DRIFTING BUOYS
W. Patzert and G. J. McNally *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p ref (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24356# Beak Consultants Ltd., Richmond (British Columbia).
INFERENCES OF FUTURE OPERATIONS DRAWN FROM PAST AND PRESENT APPLICATIONS OF DRIFTING BUOYS
Noel E. J. Boston *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p refs (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24357# Washington Univ., Seattle. Polar Science Center.
SEA-ICE MOTION IN RESPONSE TO GEOSTROPHIC WINDS
Roger Colony *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 5 p refs Sponsored in part by NSF and Navy (For primary document see N85-24348 14-42) (Grant NOAA-NA80-AA-D-00015)
Avail: NTIS HC A08/MF A01

N85-24359# National Research Inst. for Oceanology, Stellenbosch (South Africa).
ONE THOUSAND DAYS IN THE BRINE
C. C. Stavropoulos and P. A. LeRoux (South African Weather Bureau, Pretoria) *In* CNES Proc. of the ARGOS Users Conf. on Data Collection and Platform 1981 11 p (For primary document see N85-24348 14-42)
Avail: NTIS HC A08/MF A01

N85-24369# Centre National pour l'Exploitation des Oceans, Brest (France). Dept. Etudes Oceaniques.
EVALUATION OF WAVE ENERGY RESOURCES ON THE FRENCH ATLANTIC SEABOARD
Michel Ollitrault and J. M. Coudeville *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 27-35 ref In FRENCH; ENGLISH summary Sponsored by Operation Energie des Mers (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24370# National Museum of Natural History, Paris (France). Lab. d'Oceanographic Physique.
THE INDIAN OCEAN SURFACE DYNAMICS EXPERIMENT (SINODE)
G. Reverdin, M. Fieux, and J. Gonella *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 37-42 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24371# Centre d'Etudes de Meteorologie Spatiale, Lannion (France). Centre de Meteorologie Maritime.
THE ARGOS CONTRIBUTION TO THE FIRST GARP GLOBAL EXPERIMENT (FGGE) STUDY OF DRIFTING BUOYS
N. Daniault *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 43-52 refs In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24372# National Museum of Natural History, Paris (France). Lab. d'Oceanographique Physique.
MAIN FEATURES OF ANTARCTIC OCEAN CIRCULATION AS REVEALED BY SATELLITE TRACKING OF ICEBERGS
P. Tchernia *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 53-61 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24378# Aberdeen Univ. (Scotland). Zootelemetry Research Lab.
DEVELOPMENT OF ARGOS PLATFORMS FOR TRACKING OF BASKING SHARKS, CETORHINUS MAXIMUS
I. G. Priede *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 137-143 refs (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24379# Museum d'Histoire Naturelle et d'Ethnographie, La Rochelle (France).
TRANSATLANTIC MIGRATION STUDY OF THE LEATHERY TURTLE USING THE ARGOS SYSTEM. TRANSATLANTIC TURTLE RACE
Michele Duron-Dufrenne *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 145-150 In FRENCH; ENGLISH summary (For primary document see N85-

24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24383# Centre National d'Etudes Spatiales, Toulouse (France). Service ARGOS.
MISCELLANEOUS ARGOS MARITIME APPLICATIONS
R. Rolland *In its* Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 p 169-175 In FRENCH; ENGLISH summary (For primary document see N85-24366 14-42)
Avail: NTIS HC A09/MF A01

N85-24400# Rhode Island Univ., Kingston. Graduate School of Oceanography.
THE DEEP DRIFTER PROGRAM
T. Rossby and D. Dorson *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 25 p refs (For primary document see N85-24391 14-42)
(Grant NSF OCE-80-10839)
Avail: NTIS HC A10/MF A01

N85-24403# Oregon State Univ., Newport. Marine Science Center.
TRACKING WHALE MIGRATIONS WITH THE ARGOS SATELLITE SYSTEM
Bruce R. Mate and James T. Harvey *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 15 p refs (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24405# Partech Electronics Ltd., St. Austell (England).
PRACTICAL CONSIDERATIONS WHEN USING WATER QUALITY AND STRUCTURE MONITORING SENSORS AS APPLIED TO PORTABLE ARGOS SATELLITE TRANSMITTER EQUIPMENT
A. Roger Parker *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 7 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24406# Toyo Communication Equipment Co. Ltd., Kawasaki (Japan). Mobile Radio Communication Div.
DRIFTING BUOY DEVELOPMENT AND FUTURE PROGRAMS
M. Tsutsumi *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 9 p (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24408# Hermes Electronics Ltd., Dartmouth (Nova Scotia).
DEVELOPMENT OF A LOW COST DRIFTING BUOY
Fred Guptill and B. Thompson (Petro Canada) *In* CNES Data Collection and Platform Location by Satellite: ARGOS Users' Conf. 1982 20 p refs Sponsored by Canadian government (For primary document see N85-24391 14-42)
Avail: NTIS HC A10/MF A01

N85-24412# National Data Buoy Center, Bay Saint Louis, Miss.
ARABIAN GULF CIRCULATION
R. L. Pickett (Naval Ocean Research and Development Activity), R. M. Partridge, J. A. Galt (NOAA, Seattle), and R. A. Arnone (Naval Ocean Research and Development Activity) *In* CNES Data Collection and Platform Location by Satellite 1984 18 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24413# National Center for Atmospheric Research, Boulder, Colo.
A REPORT ON THE DRIFTERS PROGRAM
R. Heinmiller (OMNET), J. Masterson, and J. McWilliams *In* CNES Data Collection and Platform Location by Satellite 1984 10 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24415# Petro-Canada Ltd., Calgary (Alberta).
DRIFTING BUOYS ON THE LABRADOR SHELF
J. R. Buckley, W. C. Thompson, D. B. Fissel (Arctic Sciences Ltd., Sidney, British Columbia), and J. R. Birch (Arctic Sciences Ltd., Sidney, British Columbia) *In* CNES Data Collection and Platform Location by Satellite 1984 130 p refs Sponsored by Labrador Group of Companies (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24417# Synergetics International, Inc., Boulder, Colo.
A NEW VERSATILE ARGOS PTT FOR OCEANOGRAPHIC APPLICATIONS
R. Chris Roark, Paul Ferris Smith (Ferranti O.R.E., Inc., Falmouth, Mass.), and Daniel E. Frye (Ferranti O.R.E., Inc., Falmouth, Mass.) *In* CNES Data Collection and Platform Location by Satellite 1984 12 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24421# Oregon State Univ., Newport. Marine Science Center.
THE ARGOS SYSTEM USED FOR TRACKING GRAY WHALES
Bruce R. Mate *In* CNES Data Collection and Platform Location by Satellite 1984 6 p refs (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

N85-24422# National Data Buoy Center, Bay Saint Louis, Miss.
AN OVERVIEW OF NDBC DRIFTING BUOY DEVELOPMENT PROGRAMS
Ron Kozak and John Anderson (Polar Research Laboratory, Inc.) *In* CNES Data Collection and Platform Location by Satellite 1984 11 p ARGOS Users' Conf., 21-23 May 1984 1984 11 p (For primary document see N85-24409 14-42)
Avail: NTIS HC A14/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-24694*# National Aeronautics and Space Administration, Washington, D. C.
PROBLEMS OF SPACE BIOLOGY. VOLUME 50: NYSTAGMOMETRY FOR EVAULATION OF THE STATUS OF THE VESTIBULAR FUNCTION
M. M. Levashov and V. A. Kislyakov, ed. Apr. 1985 246 p refs Transl. into ENGLISH of the book "Problemy Kosmicheskoy Biologii, Tom 50. Nistagmometriya v Otsenke Sostoyaniya Vestibulyarnoy Funktsii" Leningrad, Nauka Press, 1984 p 1-221 Transl. by The Corporate Word, Pittsburgh
(NASA-TM-77616; NAS 1.15:77616) Avail: NTIS HC A11/MF A01 CSCL 06B

Various aspects of nystagmometry are studied, primarily those in which the study of hystagmus serves as a means to learn about the vestibular apparatus. Along with exhaustive published material, the monograph presents data from many years of research on the physioloigical mechanisms of nystagmus, the features of nystagmus when vestibular stimulation is combined with optokinetic, the pole of vertibular afferentation asymmetry in the asymmetry of reactions to optokinetic stimulus, a nystagmometric approach to studying the hydrodynamic interaction among semicircular canals, as well as several other questions. A great deal of attention is given to methods of recording nystagmus, calibrating nystagmograms, quantitative evaluation of nystagmographic material, new nystagmometric characteristics and diagnostic techniques. A diagnostic model is proposed which makes it possible to obtain important information on the condition of the vestibular system from results of vestibular testing. B.G.

N85-24695# Massachusetts Univ., Amherst. Dept. of Psychology.
BIOLOGICAL INVESTIGATIONS OF ADAPTIVE NETWORKS. NEURONAL CONTROL OF CONDITIONED RESPONDING Annual Technical Report, 31 May 1983 - 30 Apr. 1984

J. W. Moore 20 May 1984 12 p
(Grant AF-AFOSR-0215-83)
(AD-A150959; AFOSR-85-0071TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Neurobiological investigations of adaptive neural networks were initiated using the classically conditioned nictitating membrane (NM CR) of rabbit. One experimental approach involved recording from single brain neurons from awake, behaving animals for the purpose of determining the loci and characteristics of neurons with activity correlated with the NR CR or its inhibition. A second approach involved in the use of discrete brain lesions that selectively eliminate the NM CR while at the same time sparing the basic reflex pathway. A third approach employed fiber-tracing anatomical techniques designed to clarify the interconnectivity among brain regions essential for the NM CR. These regions include discrete portions of the cerebellum and brain stem. Information from physiological studies have been incorporated into mathematical models of learning used by adaptive network researchers, and anatomical findings have guided the development of related neuronal models. GRA

N85-24696# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.
NMR IMAGING AND SPECTROSCOPY OF THE MAMMALIAN CENTRAL NERVOUS SYSTEM AFTER HEAVY ION RADIATION Ph.D. Thesis
Todd Richards Sep. 1984 242 p refs
(Contract DE-AC03-76SF-00098)
(DE85-004509; LBL-18148) Avail: NTIS HC A11/MF A01

NMR imaging, NMR spectroscopic, and histopathologic techniques used to study the proton relaxation time and related biochemical changes in the central nervous system after helium beam in vivo irradiation of the rodent brain. The spectroscopic observations were made possible by development of methods for measuring the NMR parameters of the rodent brain in vivo and in vitro. Radiation induced increases were observed in lipid and p-choline peaks of the proton spectrum, in vivo. Proton NMR spectroscopy measurements on brain extracts (aqueous and organic solvents) were made to observe chemical changes that could not be seen in vivo. Radiation induced changes were observed in lactate, GABA, glutamate, and p-choline peak areas of the aqueous fraction spectra. In the organic fraction, decreases were observed in peak area ratios of the terminal methyl peaks, the N methyl groups of choline, and at a peak at 2.84 ppM (phosphatidyl ethanolamine and phosphatidyl serine resonances) relative to TMS. With histology and Evans blue injections, blood brain barrier alternations were seen as early as 4 days after irradiation. DOE

N85-24697# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
25 Mar. 1985 172 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-012) Avail: NTIS HC A08/MF A01

News items, abstracts, and scientific reports on aspects of life sciences, biomedical, and behavioral sciences including virology, radiation biology, veterinary medicine, psychology, physiology, public health, electromagnetic radiation effects, pharmacology and toxicology, molecular biology, microbiology, medicine, laser effects, genetics, immunology, epidemiology, biophysics, ecology, biotechnology, biochemistry, agrotechnology, and aerospace medicine. For individual titles, see N85-24698 through N85-24706.

N85-24698# Joint Publications Research Service, Arlington, Va.
COMPLEX PROGRAM OF ERGONOMIC STUDIES PILOT DESCRIBED **c54**
Andrey Potapenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 1-2 Transl. into ENGLISH from Nedelya (Moscow), 3-9 Dec. 1984 p 4 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

The complex program of ergonomics, Pilot, is used to help physicians in observing the state of health of the pilot from the moment he decides to become a pilot to the day he leaves civil aviation. In practice, it is a system which performs professional selection of candidates for the flying profession, evaluates the habits of the pilot in flight training; perform the preflight control of the crew; monitors the condition of the pilot in the air; and stores all necessary information. B.G.

N85-24699# Joint Publications Research Service, Arlington, Va.
SECOND SOVIET-FRENCH SYMPOSIUM ON SPACE CYTOLOGY
V. Ovcharov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 4 Transl. into ENGLISH from Sov. Estoniya (USSR), 1 Dec. 1984 p 3 Symp. held in Moscow, 30 Nov. 1984 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

As a part of space biology and medicine, space cytology studies the effects of space flight factors, particularly zero gravity, on the activity of life's primary units - animal and plant cells. Functional impairments which are observed during flights are reversible; disappearing following the return to Earth. It is important to develop methods and instruments which would make it possible to observe changes on the cellular level directly in space. Space cytologists have a considerable number of problems to solve - automatic methods for growing cell cultures in orbit and ascertaining how zero gravity affects the structure, metabolism, and functions of cells. B.G.

N85-24700# Joint Publications Research Service, Arlington, Va.
WAYS OF OPTIMIZATION OF LIGHT ENERGY TRANSFORMATION IN PRIMARY STAGES OF PHOTOSYNTHESIS. NECESSITY OF OPTIMIZATION OF PHOTOSYNTHETIC UNIT STRUCTURE AND METHOD FOR CALCULATING EFFICIENCY Abstract Only
Z. G. Fetisova and M. V. Fok *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 13 Transl. into ENGLISH from Molekulyarnaya Biol. (Moscow), v. 18, no. 6, NOv. - Dec. 1984 p 1651-1656 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

Various primary photosynthetic processes were studied to determine energy migration and light accumulation factors. Results have shown that quantum yield of primary energy charges in reaction centers occur only with pronounced optimization of photosynthetic unit parameters. A system with a given number of reaction centers and light collecting antennas with calculated numbers of molecules was studied. With rapid energy migration the upper limit of quantum yield of primary charge requires three experimental parameters, but even with these, calculated and experimental results diverge sharply. Thus, the structure of photosynthetic units in vivo must be optimized for accurate results. A high rate of energy migration alone did not provide high transmission of energy from antennas to reaction center. A new method was composed for calculating input output values. The introduction of a parameter for spectral heterogeneity of the antenna reduced the number of stages in energy migration by a factor of 4, while time involved was cut in half. Author

N85-24701# Joint Publications Research Service, Arlington, Va.
WAYS OF OPTIMIZATION OF LIGHT ENERGY TRANSFORMATION IN PRIMARY STAGES OF PHOTOSYNTHESIS. OPTIMIZATION OF LATTICE STRUCTURE OF UNIFORM PHOTOSYNTHETIC UNIT Abstract Only
Z. G. Fetisova, M. V. Fok, L. V. Shibayeva, and A. Yu. Borisov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 14 Transl. into ENGLISH from Molekulyarnaya Biol. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 1657-1663 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

The structure of the macroscopic lattice of a given type and modeled energy transfer of photosynthetic unit structure (PUS)

antenna, suggesting its inductive resonance mechanism and dipole-dipole interaction between kmolecules during energy transfer were studied. A right angle lattice with infinite two dimensional aggregates, formed with the help of translational symmetry. Parameters of the model are discussed. Results suggest two consequences for in vivo systems; the PUS macroantenna display a specific anisotropy of intermolecular spaces, then an elongated form will emerge, and if the reaction centers in vivo are grouped into clusters, then the light collecting antennas cannot be uniform and isotropic. Author

N85-24702# Joint Publications Research Service, Arlington, Va.
INSTRUMENT FOR DETERMINING SPATIAL COORDINATION OF HAND MOVEMENTS Abstract Only c52
G. I. Kutsenko, Ye. I. Soshnikov, and B. N. Minchin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 51 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 9, Sep. 1984 p 49-51 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

It is often necessary to estimate the status of the function of coordination of the movement of the hands as well as changes in the status of this function during the course of a working day. Existing devices intended to study this function have a number of shortcomings, particularly the ability of the test subject in each case to determine the speed at which the test task will be performed. A method is suggested for determining spatial coordination of movements of the hands utilizing a test involving closing of an electric circuit by moving the hand and an indicator in a horizontal plane intended to eliminate these shortcomings. The method is distinguished by the fact that to make diagnosis of the functional status of the motor apparatus more objective, the test subject is forced to move the indicator at a predetermined rate. Objective determination of the deterioration of coordination during the course of a working day is allowed. B.G.

N85-24703# Joint Publications Research Service, Arlington, Va.
HYGIENIC STANDARDIZATION OF ELECTROMAGNETIC FIELDS OF RADAR SYSTEMS Abstract Only c32
Yu. D. Dumanskiy, D. S. Ivanov, N. G. Nikitina, and L. A. Tomashevskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 96 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 9, Sep. 1984 p 37-40 (For primary document see N85-24697 14-52)
Avail: NTIS HC A08/MF A01

Radars operating in the frequency band above 300 MHz may represent a danger for the population. The applicability of the energy principle of standardization to regulation of electromagnetic fields in populated points is analyzed. Equations are derived for hygienic standardization of exposure to electromagnetic fields based on medical and biological research and the corresponding values of energy flux density created by weather systems. The equations confirm the correctness of the principle of differentiating electronic devices according to classes on the basis of the fields which they radiate. The energy approach to standardization in the millimeter decimeter waveband is generally incorrect, but can be useful in establishing the variation of maximum permissible level as a function of time for individual types of radars. Author

N85-24704# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PATTERNS OF FUNCTIONAL CHANGES OF HUMAN RESPIRATORY SYSTEM IN ADAPTATION TO HIGH PRESSURE Abstract Only c52
S. A. Gulyar *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 116 Transl. into ENGLISH from Fiz. Zh. (Kiev), v. 30, no. 6, Nov. - Dec. 1984 p 667-679 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

Results of physiological regulation mechanisms of the transfer of respiratory gas in the human body under increased pressure in nitrogen oxygen are reported. In moderate pressures human oxygen is characterized by increased rate and intensity of O2 intake into alveoli, elevated PO2 in alveoli and in arterial blood but decreased rate and intensity of its transport by arterial and venous blood and lower PO2 in the latter. The principal respiratory mechanisms show an increased physiological respiratory and dead volume, lowered alveolar ventilation in the lungs, slower diffusion of O2 through the alveolar capillary barrier, higher unevenness of ventilation perfusion ratio in the lungs, lower capillary blood flow in lungs and higher blood shunting. In the pressure range 0.25 to 0.5 MPa the hyperbaric factors may be arranged in the following order of increasing effect: compression and temperature stress; hyperoxia; increased density, partial pressure of nitrogen and temperature of the respiratory medium; and hypodynamics. B.G.

N85-24705# Joint Publications Research Service, Arlington, Va.
EFFECT OF BROAD-BAND CONSTANT NOISE ON SOME SYSTEMS OF ANIMAL BODY Abstract Only
L. V. Pochobut *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 117 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 11, Nov. 1984 p 36-38 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

The nature of response reactions of the animal body to one time effect of broad band noise at the 83 decibel A level for 3 hours are described and discussed. The functional state of the central nervous system, cardiovascular system and some metabolism parameters were studied in 12 rabbits (wt 2100 to 2600 g). Single effect of the noise caused reduction of bioelectrical activity of the rabbit brain, especially the alpha rhythm. The noise used caused insignificant hypertension (3.3 percent), increase of heart rate and increase of contractile capacity of the myocardium (by change of the QRS wave) but did not affect auricular or intraventricular conductivity. The functional shifts shown were attributed to the effect of regulation of physiological equilibrium in the system and not to any pathological reaction. It was recommended that these bodily changes in reaction to noise may be used to develop a method of individual sensitivity to noise.
Author

N85-24706# Joint Publications Research Service, Arlington, Va.
EXTRACTION OF IONS FROM SOLUTIONS AT ATMOSPHERIC PRESSURE, MASS SPECTROMETRIC ANALYSIS OF BIOORGANIC SUBSTANCES Abstract Only c25
M. L. Aleksandrov, L. N. Gall, N. V. Krasnov, V. I. Nikolayev, V. A. Pavlenko, and V. A. Shkurov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 152 Transl. into ENGLISH from Dokl. Akad. Nauk SSR (Moscow), v. 277, no. 2, Jul. 1984 p 379-383 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

A method was developed for extraction of dissolved ions at atmospheric pressure allowing production of mass spectra of low volatility and thermally unstable bioorganic substances with a controlled degree of fragmentation or clustering of quasimolecular ions. By controlling the type of mass spectrum, information on molecular weight, structural specifics of compounds, interaction of ions with neutral molecules in the solvent, as well as the kinetics and mechanism of the ion molecular reaction can be obtained. The key is an ion source consisting of a metal capillary which injects a solution into a system of diaphragms forming a gas dynamic jet. By increasing the voltage difference across the diaphragms the device breaks up cluster ions and yields mass spectra consisting only of quasi-molecular ions. This method of obtaining ions directly from the liquid phase allows mass spectrometric analysis of thermally unstable compounds which are difficult to volatilize without preliminary chemical protection of polar and labile groups, yielding information both on molecular weight and on the structure of the substance studied. B.G.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-24707 Ball State Univ., Muncie, Ind.
AEROBIC AND ANAEROBIC EXERCISE TOLERANCE IN THE

HEAT: EFFECT AND ACCLIMATIZATION Ph.D. Thesis
Douglas Scott King 1984 119 p
Avail: Univ. Microfilms Order No. DA8429661

The effect of heat acclimatization on aerobic exercise tolerance in the heat, and on subsequent anaerobic exercise performance was investigated. Ten male subjects were acclimatized by exercising 80 minutes per day for eight days in the heat (39.7 C db, 31.0% RH) on a bicycle ergometer at a workload corresponding to 54% of VO2 max. Prior to and following heat acclimatization, the subjects performed six hours at intermittent, submaximal (50% VO2 max) exercise in the heat (HET). A 45 sec maximal bicycle ride was performed before (sprint 1) and after (sprint 2) each HET. Mean (+ or - SE) resting plasma volume was higher (+9.2 + or 0 1.7%) in acclimatized subjects (ACC) compared with unacclimatized (UN) subjects ($P < 0.001$). Muscle glycogen utilization during the HET was greater in the UN trial (57.4 + or - 5.1 mmol/kg) than the ACC trial (26.6% + or - 6.4 mmol/kg, $P < 0.05$). No differences were noted between the UN and ACC trials with respect to blood glucose, lactate (LA), or respiratory exchange ratio during the HET. Dissert. Abstr.

N85-24708 Cincinnati Univ., Ohio.
THE EFFECT OF OCCUPATIONAL EXPOSURE AND THE BODY WEIGHT TO HEIGHT RATIO ON EXHALED METHYLENE CHLORIDE BREATH CONCENTRATION IN FEMALES AT ONE, EIGHTEEN AND SIXTY-SIX HOURS POST EXPOSURE Ph.D. Thesis
Phillip Gordon Brown 1984 248 p
Avail: Univ. Microfilms Order No. DA8425369

The storage of methylene chloride in the body fat reservoir offers the possibility of extended low level exposure to workers during offwork hours. The exhaled breath of female workers for methylene chloride using a cryogenic trapping technique was examined. This was correlated to exposure concentrations in the workplace. Specifically the study was designed to (1) quantitate the weekly occupational exposures using a charcoal tube sampling technique, (2) measure the cryogenically collected methylene chloride in the expired air of exposed workers at one, 18, and 66 hours post exposure, (3) measure the carboxyhemoglobin in the blood of the workers at the end of the work week, and (4) develop regression equations for predicting exhaled breath concentration of methylene chloride and blood carboxyhemoglobin as a function of methylene chloride exposure concentration and body fat. Dissert. Abstr.

N85-24709*# California Univ., San Francisco.
ALTERATIONS IN GUT TRANSPORT OF MINERALS AND IN BINDING PROTEINS DURING SIMULATED WEIGHTLESSNESS Final Technical Report, 1 Aug. 1981 - 1 Nov. 1984
Daniel D. Bikle 1 Nov. 1984 13 p
(Grant NAGw-236)
(NASA-CR-175637; NAS 1.26:175637) Avail: NTIS HC A02/MF A01 CSCL 06S

The structural components of the skeleton develop and are maintained in a 1 g environment, shaped by the mechanical load to which they are constantly exposed. Altering such a mechanical load by reducing the gravitational force imposed on the system, as in space flight, has profound effects on the skeleton and permits an exploration of the molecular events which regulate normal skeletal homeostasis. The objective was to determine whether simulated weightlessness reduced intestinal calcium transport, and if so, to determine the molecular mechanisms for such an effect. A nonstressful tail suspension in which the rats gained weight normally while suspended was used to simulate weightlessness. A significant change in intestinal calcium transport was not demonstrated. However, a cyclic change in bone formation with suspension was shown. Based on these observations, the objective changed to determination of the hormonal regulation of bone formation during simulated weightlessness. E.A.K.

N85-24710# Army Research Inst. of Environmental Medicine, Natick, Mass.
PERIPHERAL CHANGES IN REGIONAL SWEATING RESPONSES TO EXERCISE IN HYPOBARIC ENVIRONMENTS
M. A. Kolka, L. A. Stephenson, P. A. Rock, and R. R. Gonzalez Feb. 1985 27 p
(DA Proj. 3E1-62777-A-878)
(AD-A150757; USARIEM-M-14/85) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effect of hypobaric hypoxia on the relation of regional sweating to body temperature rise was studied in four men and four women (follicular phase of menstrual cycle) who exercised 40 and 60% of their altitude specific peak aerobic power at 770 Torr (sea level), 552 Torr (2596m), and 428 Torr (4575m) in 20 C or 30 C for 35 minutes. Body temperature and sweating at the chest (C), arm (A) and thigh (T) were measured continuously from dew point sensors attached to the skin. No gender differences were found in either the sensitivity (slope) or the threshold of the sweating to body temperature for any site during any combination of exercise intensity, altitude or environmental temperature. In all experimental conditions, the mean body temperature threshold for the initiation of A (36.7 C) sweating was higher ($P<0.05$) than C (36.5 C). The mean slopes of the sweating to body temperature relationships for the three regional sites during the exercise-temperature combinations decreased with increasing altitude. Our data indicate that there are peripheral components active in the regional sweating to body temperature relationship that occur in hypobaric hypoxia. Enhanced body cooling as a response to the higher evaporative capacity of the environment may be a component of these peripheral differences occurring in hypobaric hypoxia. GRA

N85-24711# Naval Health Research Center, San Diego, Calif.
SPARTEN (SCIENTIFIC PROGRAM OF AEROBIC AND RESISTANCE TRAINING EXERCISE IN THE NAVY): A TOTAL BODY FITNESS PROGRAM FOR HEALTH AND PHYSICAL READINESS Interim Report
E. J. Marcinik Aug. 1984 55 p
(AD-A150869; NAVHLTHRSCHC-84-38) Avail: NTIS HC A04/MF A01 CSCL 06/14

Based on data collected from several Navy male and female populations a SPARTEN (Scientific Program of Aerobic and Resistance Training Exercise in the Navy) physical training system was developed. The comprehensive exercise format was specifically designed to enhance the health and job performance of Navy men and women. Contents include a general description of all stretching and circuit weight training exercises as well as instruction on proper breathing and weight lifting techniques. In addition, basic and advanced conditioning programs tailored for both ship and shore installations are provided. GRA

N85-24712# Naval Aerospace Medical Research Lab., Pensacola, Fla.
RESULTS OF A LONGITUDINAL STUDY OF AIRSICKNESS DURING NAVAL FLIGHT OFFICER TRAINING: EXECUTIVE SUMMARY
W. C. Hixson, F. E. Guedry, Jr., and J. M. Lentz 9 Nov. 1984 10 p
(AD-A150887; SR-85-2) Avail: NTIS HC A02/MF A01 CSCL 06/5

This paper is an executive summary of a series of reports describing a longitudinal study of airsickness in a large sample of Naval Flight Officers being trained to perform various nonpilot flight duties prior to fleet assignment. Airsickness data are reported on over 28,000 individual hops flown by approximately 800 students as they progressed through the Basic, Advanced, and Fleet Readiness Squadron phases of their flight training. Topics discussed include: airsickness as a function of phase of training; pipeline differences; individuals with repeated difficulties; predictive laboratory tests; attritions; use of medication; and methods of identifying students with a continuing airsickness problem. GRA

N85-24713# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECT OF SET SIZE ON COLOR MATCHING Interim Report
S. M. Luria, D. F. Neri, and A. R. Jacobsen 14 Jan. 1985 29 p (AD-A150899; NSMRL-1041) Avail: NTIS HC A03/MF A01 CSCL 06/16

Current monochromatic sonar displays are soon to be replaced with chromatic ones. It is anticipated that color coding will enhance the performance of the sonar operators. A number of review articles, however, have pointed out that there are both advantages and disadvantages to the use of color coding. Used inappropriately, it may even degrade performance. The correct application of color coding depends on the nature of the task to be performed, the choice of colors, the number of colors, etc. This study sought to determine the effect of increasing the number of colors used in a color-coded CRT/display on the time required to match the colors. The time required to match a colored stimulus to one of a set of colors was measured as a function of color sets ranging in size from 2 to 10. Reaction time (RT) increased linearly with increases in set-size to five or six, after which the increase, although still linear was less steep. Mean errors increased sharply with set sizes of 9 and 10. The relative RTs to the different colors remained constant despite changes in the experimental method. GRA

N85-24714# Army Research Inst. of Environmental Medicine, Natick, Mass.
PREPARING ALBERTO SALAZAR FOR THE HEAT OF THE 1984 OLYMPIC MARATHON
L. E. Armstrong, R. W. Hubbard, B. H. Jones, and J. T. Daniels Jan. 1985 24 p
(DA Proj. 3E1-62777-A-879)
(AD-A150942; USARIEM-M-13/85) Avail: NTIS HC A02/MF A01 CSCL 06/19

Observations were made on American marathon record holder Alberto Salazar during a climatic chamber trial, heat acclimatization training, and the 1984 Olympic Marathon. Blood samples and rectal temperature data showed that hormonal and thermoregulatory mechanisms were normal. However, measurements of a very high sweat rate (2.79 liter/hr and 3.06 liter/hr) indicated that dehydration was a potentially serious problem. In fact, Salazar lost 5.43 kg (-8.1 percent) during the Olympic marathon, in 134.3 minutes of running. Although Salazar's decreased rectal temperature was desirable, his increased sweat rate was an unnecessary physiological adaptation to training in the heat. GRA

N85-24715# School of Aerospace Medicine, Brooks AFB, Tex.
MEDICAL PLANNING CRITERIA FOR IMPLEMENTATION OF CLINICAL HYPERBARIC FACILITIES Final Report, Oct. 1983 - Aug. 1984
W. T. Workman, M. D. Robinette, T. D. Laird, and F. S. Cramer Dec. 1984 75 p
(AD-A151001; USAFSAM-TR-84-36) Avail: NTIS HC A04/MF A01 CSCL 06/12

The purpose of this technical report is three-fold. First, it provides a review of the design criteria used to determine the size of the clinical hyperbaric chamber. The upright cylinder chamber arrangement had been selected for this purpose after careful consideration of the available options. Secondly, it provides a method for determining the cost of air transportation between DoD regions which has been reviewed and validated by the Military Airlift Command Surgeon in November 1983. Thirdly, it describes a method to predict patient treatments in advance of facility availability which is crucial to facility planning. A system based on inpatient International Classification for Disease Nomenclature - 9th Edition (ICD-9) criteria has been developed and is presented in detail in the Patient Population Data paragraph. This report provides the various planning data necessary for future design and construction of clinical hyperbaric facilities in the U.S. Air Force. The concepts presented are suitable for application to DoD, VA, and civilian medical centers that are planning clinical hyperbaric facilities. GRA

N85-24716# Army Research Inst. of Environmental Medicine, Natick, Mass.
THE ENERGY COST OF WOMEN WALKING AND RUNNING IN SHOES AND BOOTS
B. H. Jones, J. J. Knapik, W. L. Daniels, and M. M. Toner 12 Feb. 1985 15 p
(AD-A151022; USARIEM-M-17/85) Avail: NTIS HC A02/MF A01 CSCL 15/5

The purpose of this study was to determine the difference in energy cost for women walking and running in shoes versus heavier boots. Subjects were 7 volunteers. Each subject wore both athletic shoes (avg wt = 514 + or - 50.3g) and leather military boots (avg wt = 1371 + or - 104g) at 3 walking speeds and 2 running speeds. During each walking and running trial oxygen uptake was measured. The V02 for women wearing boots were significantly higher than for shoes for both walking and running with the exception of the slowest walking speed. The average increment in energy cost was 1.0 percent per 100g increase in weight per pair of footwear. These results are similar to those reported for men from other studies which found increments in energy cost of 0.7 to 0.9 percent per 100g increase in weight of footwear.
Author (GRA)

N85-24717# Army Research Inst. of Environmental Medicine, Natick, Mass.
EXERCISE-HEAT STRAIN DURING HYPOHYDRATION: INTERACTION WITH HEAT ACCLIMATION AND AEROBIC FITNESS
M. N. Sawka and K. B. Pandolf 1985 29 p Presented at the 14th Commonwealth Defence Conf. Operational Clothing and Combat Equipment
(DA Proj. 3E1-62777-A-879)
(AD-A151023; USARIEM-M-15/85) Avail: NTIS HC A03/MF A01 CSCL 06/19

During military operations in hot environments, the combined metabolic and environmental heat stress must be dissipated by the soldier to enable sustained physical exercise performance. The primary factors influencing a soldier's thermoregulatory responses during exercise-heat stress are acclimation state, aerobic fitness and hydration level. During physical exercise in the heat, sweat output often exceeds water intake, resulting in hypohydration, which is defined as a body water deficit. Hypohydration causes a greater heat storage and reduces physical exercise performance relative to euhydration levels. The greater heat storage is attributed to a decreased sweating rate as well as a decreased cutaneous blood flow. The greater the level of hypohydration, the greater the magnitude of cardiovascular and thermoregulatory strain and reduced physical exercise performance. Rectal temperature and heart rate responses are elevated above euhydration levels by about 0.15 C and 4 b/min for each percent decrease in body weight during exercise-heat stress, respectively. Likewise, sweating rates are decreased by about 29/sq m/h for each percent decrease in body weight. When hypohydrated, heat acclimation decreases thermoregulatory and cardiovascular strain in a comfortable environment, but only decreases cardiovascular strain in hot environments during exercise. GRA

N85-24718# Rochester Univ., N. Y. Dept. of Computer Science.
VISUAL RECOGNITION OF SIMPLE OBJECTS BY A CONNECTION NETWORK
D. C. Plaut Aug. 1984 48 p
(Contract N00014-82-K-0193)
(AD-A151043; TR-143) Avail: NTIS HC A03/MF A01 CSCL 12/1

A difficult problem in vision research is specifying how meaningful objects are recognized using the visual feature information extracted from an image. The fundamental issue involves the interaction of different levels of representation of visual information. The technical and theoretical problems that must be addressed in specifying this interaction arise in any attempt to

model visual object perception. We attempt to deal with some difficult aspects of this process within the context of Feldman's Four Frames model of visual perception. The model consists of four continually interacting representational frames, expressed in terms of a massively parallel, connectionist formalism. Within the Four Frames model, the problem of accessing object representations using visual feature information can be defined in specific computational terms. This paper presents the detailed design of a connectionist model as a possible solution to some of the major problems in the visual recognition of objects. The model proposes that an object is represented as a hierarchical structure of geometric subparts. Recognition proceeds by determining in parallel that all subparts of an object are present in the image, and then sequentially verifying that each subpart is in the proper spatial relation to the others. Implementation results demonstrate that the model can recognize any of a set of simple objects given fairly general feature input. Although the model is developed in the context of a drastically simplified visual domain, the principles it embodies are argued to adhere to many of the behavioral and biological constraints of real-world vision. GRA

N85-24719# Brookhaven National Lab., Upton, N. Y.
PHOTOREACTIVATION AND OTHER ULTRAVIOLET/VISIBLE LIGHT EFFECTS ON DNA IN HUMAN SKIN
B. M. Sutherland, A. D. Blackett, N. I. Feng, S. E. Freeman, E. S. Ogut, R. W. Gange, and J. C. Sutherland 1984 13 p refs Presented at New York Acad. of Sci. Conf. on Med. and Biol. Effects of Light, N.Y., 31 Oct. 1984 Prepared in cooperation with Harvard Medical School, Boston, Mass.
(Contract DE-AC02-76CH-00016)
(DE85-005135; BNL-35477; CONF-8410211-1) Avail: NTIS HC A02/MF A01

A computer based system was devised for examining low levels (1 dimer/10(8) d) of DNA damage in human skin exposed to ultraviolet or visible radiation. The production of measurable levels of dimers was determined for light of wavelengths absorbed directly by DNA (290-320 nm). Exposure of skin to UV-A (320-380 nm) sources produced a significant numbers of endonuclease-sensitive sites. The immediate pigment darkening reaction (IPD) is tested for whether IPD protects against uv-induced dimer formation. DOE

N85-24720# Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF THE ISOENERGY PRINCIPLE AND THE A WEIGHTING TO EVALUATE LESION RISKS DUE TO NOISE IN A MILITARY ENVIRONMENT [UTILISATION DU PRINCIPE D'ISOENERGIE ET DE LA PONDERATION A POUR L'EVALUATION DES RISQUES LESIONNELS DUS A L'EXPOSITION AUX BRUITS DANS UN ENVIRONNEMENT MILITAIRE]
A. Dancer 13 Oct. 1983 10 p In FRENCH Presented at Intern. Symp. on the Effects of Noise on Hearing, Oslo, May 1982
(ISL-CO-231/83) Avail: NTIS HC A02/MF A01

A method to evaluate lesion effects of military noise to predict the risks of exposure to acoustic impulses (arms noise) for persons with and without protection devices, and to avoid the errors inherent in the utilization of the present standards which do not take into account the noise amplitude spectrum is proposed. The method is based on the isoenergy principle and on the fact that the only important quantity for the evaluation of lesion risks is the acoustic signal penetrating the cochlea. This quantity is evaluated by the A weighted curve. Author (ESA)

N85-24145# Joint Publications Research Service, Arlington, Va.
ADVANCES IN STUDY OF COLD INJURY IN ARMY
Liu Enbo *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 48-52 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Peking), no. 6, 20 Dec. 1983 p 469-470 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

N85-24426# Joint Publications Research Service, Arlington, Va.
PLANS FOR ADAPTATION RESEARCH DURING ANTARCTIC EXPEDITION Abstract Only
A. Mkhitaryan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 4 Transl. into ENGLISH from Sotsialisticheskaya Ind. (USSR), 31 Oct. 1984 p 4 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

N85-24702# Joint Publications Research Service, Arlington, Va.
INSTRUMENT FOR DETERMINING SPATIAL COORDINATION OF HAND MOVEMENTS Abstract Only
G. I. Kutsenko, Ye. I. Soshnikov, and B. N. Minchin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 51 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 9, Sep. 1984 p 49-51 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

N85-24704# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PATTERNS OF FUNCTIONAL CHANGES OF HUMAN RESPIRATORY SYSTEM IN ADAPTATION TO HIGH PRESSURE Abstract Only
S. A. Gulyar *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 116 Transl. into ENGLISH from Fiz. Zh. (Kiev), v. 30, no. 6, Nov. - Dec. 1984 p 667-679 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-24721*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
USERS GUIDE: THE LaRC HUMAN-OPERATOR-SIMULATOR-BASED PILOT MODEL
Edward H. Bogart and Marvin C. Waller Apr. 1985 47 p refs (NASA-TM-86367; NAS 1.15:86367) Avail: NTIS HC A03/MF A01 CSCL 05I

A Human Operator Simulator (HOS) based pilot model has been developed for use at NASA LaRC for analysis of flight management problems. The model is currently configured to simulate piloted flight of an advanced transport airplane. The generic HOS operator and machine model was originally developed under U.S. Navy sponsorship by Analytics, Inc. and through a contract with LaRC was configured to represent a pilot flying a transport airplane. A version of the HOS program runs in batch mode on LaRC's (60-bit-word) central computer system. This document provides a guide for using the program and describes in some detail the assortment of files used during its operation. Author

N85-24722*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FACTORS AFFECTING DWELL TIMES ON DIGITAL DISPLAYING
Allen J. Williams and Randall L. Harris, Sr. Apr. 1985 35 p refs (NASA-TM-86406; NAS 1.15:86406) Avail: NTIS HC A03/MF A01 CSCL 05I

A series of exploratory tests were conducted to investigate the effects of advanced display formats and display media on pilot scanning behavior using Langley's oculometer, a desktop flight simulator, a conventional electro-mechanical meter, and various digital displays. The primary task was for the test subject to maintain level flight, on a specific course heading, during moderate turbulence. A secondary task of manually controlling the readout of a display was used to examine the effects of the display format on a subject's scan behavior. Secondary task scan parameters that were evaluated were average dwell time, dwell time histograms, and number of dwells per meter change. The round dial meter demonstrated shorter dwell times and fewer dwells per meter

change than the digital displays. The following factors affected digital display scanning behavior: (1) the number of digits; (2) the update rate of the digits; (3) the display media; and (4) the character font. The size of the digits used in these tests (0.28 to 0.50 inches) did not affect scan behavior measures. Author

N85-24723# Stanford Univ., Calif. Dept. of Computer Science.
PERCEPTUAL ORGANIZATION AND VISUAL RECOGNITION Ph.D. Thesis
D. G. Lowe Sep. 1984 150 p
(Contracts N00039-82-C-0250; MDA903-80-C-0102; Grant NSF DAR-78-15914)
(AD-A150826; SU-STAN-CS-84-1020) Avail: NTIS HC A07/MF A01 CSCL 05/10

A computational model is presented for the visual recognition of three-dimensional objects based upon their spatial correspondence with two-dimensional features in an image. A number of components of this model are developed in further detail and implemented as computer algorithms. At the highest level, a verification process was developed which can determine exact values of viewpoint and object parameters from hypothesized matches between three-dimensional object features and two-dimensional image features. This provides a reliable quantitative procedure for evaluating the correctness of an interpretation, even in the presence of noise or occlusion. Given a reliable method for final evaluation of correspondence, the remaining components of the system are aimed at reducing the size of the search space which must be covered. Unlike many previous approaches, this recognition process does not assume that is is possible to directly derive depth information from the image. Instead, the primary descriptive component is a process of perceptual organization, which spatial relations are detected directly among two-dimensional image features. A basic requirement of the recognition process is that perceptual organization should accurately distinguish meaningful groupings from those which arise by accident of viewpoint or position. GRA

N85-24724# Brown Univ., Providence, R. I. Center for Neural Science.
A MODEL FOR GENERALIZATION AND SPECIFICATION BY SINGLE NEURONS
P. Munro 8 Feb. 1985 37 p
(Contract N00014-81-K-0136)
(AD-A150871; TR-20) Avail: NTIS HC A03/MF A01 CSCL 06/16

A rule for environmentally dependent modification of the neuronal state is examined. Under the rule, the neuron selects a trigger feature that matches either a particular pattern in the stimulus set, or the most common pattern component, depending on a certain parameter. Thus a neuron may evolve to respond to its stimulus environment in one of two capacities, namely specification or generalization. Neurons of the former variety are labelled S-cells; and those of the latter, G-cells. In the model, synaptic modification is modulated by two postsynaptic mechanisms, which act antagonistically to strengthen or weaken the synaptic connectivities. The functional dependence of these mechanisms on the postsynaptic activity is shown to determine whether the neuron acts as an S-cell or a G-cell. A circuit is proposed for a module that consists of a G-cell and several S-cells sharing a common set of inputs. By inhibiting the G-cells, the S-cell acts as a contrast-enhancing element, increasing their specificities for individual patterns in the stimulus set. The output from the module is a recorded representation of the environment with respect to its general and distinctive features. GRA

N85-24725# Purdue Univ., Lafayette, Ind. Dept. of Psychological Sciences.
STEREOTYPE TRAITS CAN BE PROCESSED AUTOMATICALLY Interim Technical Report
E. R. Smith and N. R. Branscombe Dec. 1984 44 p
(Contract N00014-84-K-0288; Grant NSF BNS-79-22366)
(AD-A150947; TR-ONR-3) Avail: NTIS HC A03/MF A01 CSCL 05/10

Stereotypes can theoretically influence information processing in two different ways: through passive activation of stereotype-related trait concepts in a network memory structure, or through consciously generated expectancies and inferences. A priming paradigm was adapted to investigate the role of these two processes in the case of gender and occupational stereotypes. In two experiments, subjects pronounced trait words as rapidly as possible. The trait words were preceded by either a neutral priming word or a social group label (e.g., male or lawyer) with respect to which the traits were stereotype-consistent, inconsistent, or irrelevant. The pronunciation time was measured to index the degree of activation on the trait concept in memory, produced by the stereotyped group label. Results showed that gender stereotypes activate their associated traits automatically whereas occupational stereotypes activate related traits mainly through conscious expectancies. Practical and theoretical implications of the results are discussed, particularly with regard to the prospects for integration of social cognition and general cognitive models of memory and inference processes. Author (GRA)

N85-24726# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECT OF SET SIZE ON COLOR RECOGNITION Interim Report
A. R. Jacobsen and D. F. Neri 25 Jan. 1985 22 p
(AD-A150958; NSMRL-1042) Avail: NTIS HC A02/MF A01 CSCL 05/10

In two separate studies a modification of Sternberg's (13) memory task was used to study the effect of the set size of colored CRT presented stimuli on time to recognition. In both, set sizes from one to seven differently colored circles (memory set) were presented for a variable period of time. Subsequently one colored circle, that had a .50 probability of belonging to the memory set, was presented and the subject responded as to whether or not be believed it belonged to the memory set. In the first study, completely different colors, were used for each set size. Some significant rises in reaction time were found as set size increased but these were definitely not linear. In a second study, successive color sets were incremented by the addition of one color. This made the sets more similar to one another and also created a condition of over-learning for the sets. The results showed no significant differences among the set sizes from two to seven colors. Hence, it appears that for color sets that are fairly well learned, there is no significant effect of set size on time to recognition, at least for set sizes up to seven elements.
Author (GRA)

N85-24727# Illinois Univ., Urbana. Engineering-Psychology Research Lab.
THE EFFECT OF STRATEGY IN SECOND ORDER MANUAL CONTROL ON RESOURCE COMPETITION WITH A STERNBERG MEMORY SEARCH TASK
B. P. Goettl and C. D. Wickens Mar. 1984 41 p
(Contract N00014-79-C-0658)
(AD-A150985; EPL-84-3/ONR-84-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study examines the effects of two different strategies of second order manual control performance on dual-task interference using the multiple resources framework. A response-strategy involves discrete time-optimal double impulse control based on momentary error. A perceptual strategy involves continuous control based upon momentary error velocity. Subjects can obtain equal levels of single task performance on both tasks. Each strategy is then time-shared with a Sternberg Memory Search task, which uses either spatial or visual material and is displayed either auditorily or visually. Two different biases of resource allocation between the two tasks are also included. An additional manipulation was task emphasis. In different conditions subjects are requested to emphasize tracking on the Sternberg task. The results indicated that performance using the response strategy showed a greater effect of changes in the Sternberg task code and modality than did performance using the perceptual strategy. Benefits in dual-task

performance were realized with the auditory display when in double impulse, but not the continuous strategy, was employed. GRA

N85-24728*# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychiatry.
ANALYSIS OF TEAM PERFORMANCE IN A PROGRAMMED ENVIRONMENT Final Report
H. H. Emurian 11 Feb. 1985 18 p
(Grant NGR-21-001-111; Contract N00014-80-C-0467)
(NASA-CR-175634; NAS 1.26:175634; AD-A150991; TR-ONR-11)
Avail: NTIS HC A02/MF A01 CSCL 05J

A research project was undertaken to investigate performance effectiveness within the context of a laboratory environment in which both interpersonal and work behaviors can be continuously monitored and evaluated over extended time periods (e.g., days). The project did not attempt to simulate a specific operational environment. Rather, the laboratory facility was designed to address a broad range of performance problems from the perspective of a functional analysis of performance effectiveness. It is essentially a programmed environment with design features and measurement capabilities that permit the accurate assessment of relationships between antecedent conditions (e.g., incentive schedules, membership turnover, etc.), and performance effectiveness. This report summarizes fourteen residential studies devoted to analyses of incentive schedules and team turbulence on individual and small-group performance in a continuously programmed environment. During the contract period, a Team Multiple Task Performance Battery (TMTPB) was developed that required a coordinated response among members of three-person teams. GRA

N85-24729# Purdue Univ., Indianapolis, Ind.
PERCEIVED HETEROGENEITY AND ITS EFFECT ON VARIOUS TYPES OF TASKS Final Report
R. Adams-Terem, J. Fross, D. Landis, and R. Hayles 1 Feb. 1985 35 p
(Contract N00014-83-K-0021)
(AD-A151003; Rept-85-1-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study investigated the effects of group composition and evaluation instructions on a motor task, a creative-cognitive task and a cognitive decision-making task. An anonymous group technique was used to control for extraneous variables that are frequently present in small group studies. The subjects were 48 females from undergraduate courses at the University of Hawaii. A 2 x 4 (composition X instruction) ANOVA was computed performance on each tasks. A significant main effect for group, showing improvement under perceived heterogeneous affiliation, was found using the creative cognitive dependent variable ($p < .05$). Significant group x instruction interactions were found for the cognitive decision-making task (p less than .02) and the motor task (p less than .04). These findings are addressed in terms of factors inherent in the composition of the groups and nature of the tasks. Implications for future research are outlined and discussed. GRA

N85-24730# Michigan Univ., Ann Arbor.
THE ROLE OF PRIOR KNOWLEDGE IN OPERATING EQUIPMENT FROM WRITTEN INSTRUCTIONS Final Report, 1 Sep. 1981 - 28 Feb. 1985
D. E. Kieras 20 Feb. 1985 45 p
(Contract N00014-84-K-0731; DA Proj. RR0-4206)
(AD-A151007; FR-85/ONR-19) Avail: NTIS HC A03/MF A01 CSCL 05/10

This report summarizes a set of results on the role of prior knowledge in how people operate electronic equipment from written instructions. These results cover two situations: In the first, the prior knowledge is possessed by subjects prior to the experiment. These studies involved comprehension and memory of technical text, expertise in descriptions of familiar and unfamiliar pieces of equipment, and expertise effects in following instructions that differ in organization. In the second situation, the prior knowledge was provided as a part of the training involved in the experiments. These studies concerned the role of knowledge of how a system works, and transfer procedures. Simulation models were constructed and compared in detail to the data, yielding significant theoretical conclusions about the mechanisms involved in the effective use of prior knowledge. The work has considerable practical significance for equipment training and maintenance. GRA

N85-24731# Bernard Baruch Coll., New York. Psychophysiology Lab.
PSYCHOPHYSIOLOGICAL STUDIES. 1: PERFORMANCE AND PHYSIOLOGICAL RESPONSE IN LEARNING, SHORT-TERM MEMORY AND DISCRIMINATION TASKS Annual Report, 1 Oct. 1983 - 30 Sep. 1984
J. L. Andreassi and N. M. Juszczak 30 Nov. 1984 91 p
(Grant AF-AFOSR-0304-83)
(AD-A151018; AFOSR-85-0070TR; AR-1) Avail: NTIS HC A05/MF A01 CSCL 05/10

The report details the background, findings and conclusions of three studies completed in the Psychophysiology Laboratory of Baruch College, City University of New York, over the past twelve months. The first experiment was concerned with the effects of varied frequency of light stimulation upon verbal learning and a number of physiological responses, including: heart rate (HR), electromyogram (EMG), pulse wave velocity (PWV) and skin temperature (ST). The main findings were that HR was sensitive to task difficulty, while EMG was affected by frequency of light stimulation. Another finding was that lower baseline HR was related to better learning performance. The second study examined the effects of intensity of light stimulation on performance in a short term memory task (Sternberg paradigm) and a variety of physiological measures, including the event-related brain potential (ERP), HR, EMG, PWV, and ST. The major findings were that the endogenous component of the ERP (the P3 response) was delayed in latency with increased memory set size under the condition of no light stimulation. In the third study, we focused upon an examination of possible differences between the left and right hemispheres of the brain in processing verbal (words) versus spatial (areal size estimation) materials. GRA

N85-24732# Michigan Univ., Ann Arbor.
THE ACQUISITION OF PROCEDURES FROM TEXT. A PRODUCTION-SYSTEM ANALYSIS OF TRANSFER OF TRAINING
D. E. Kieras and S. Bovair 29 Jan. 1985 40 p
(Contract N00014-84-K-0731)
(AD-A151029; TR-85; ONR-TR-16) Avail: NTIS HC A03/MF A01 CSCL 05/9

The current theory of cognitive skill describes knowledge of procedures in terms of a production rule representation which is constructed on the basis of an initial declarative (propositional) representation. In these terms, learning a procedure from written instructions consists of converting the propositional content of the written material into production rules. This process was studied in a transfer of training experiment. Subjects learned from step-to-step instructions a series of related procedures for operating a simple device, with the major manipulation being the order of learning the procedures. Very strong transfer effects were obtained, which could be predicted very well by a simple model of transfer. Individual production rules can be transferred, or re-used in the representation of a procedure if they appeared in a previously learned procedure, meaning that learning time is mostly a function of the number of completely new production rules that must be acquired. Examination of the time required to read individual instruction steps suggests, however, that this transfer mechanism involves processes acting on declarative propositional representatives of the production rules. This means that the transfer process is more similar to comprehension processes rather than conventional practice mechanisms, or Anderson's (1982) learning principles. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-24733*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FOOD SERVICE AND NUTRITION FOR THE SPACE STATION
Richard L. Sauer, ed. Apr. 1985 99 p refs Workshop held in Houston, Tex., 10-11 Apr. 1984
(NASA-CP-2370; S-541; NAS 1.55:2370) Avail: NTIS HC A05/MF A01 CSCL 06H

The proceedings of the Workshop on Food Service and Nutrition for the Space Station, held in Houston, Texas, on April 10 and 11, 1984 was given. The workshop was attended by experts in food technology from industry, government, and academia. Following a general definition of unique space flight requirements, oral presentations were made on state of the art food technology with the objective of using this technology to support the space flight requirements. Numerous areas are identified which in the opinion of the conferees, would have space flight application. But additional effort, evaluation, or testing to include Shuttle inflight testing will be required for the technology to be applied to the Space Station. For individual titles, see N85-24734 through N85-24748.

N85-24734*# Little (Arthur D.), Inc., Cambridge, Mass.
THE CONTEXT FOR FOOD SERVICE AND NUTRITION IN THE SPACE STATION
Peter E. Glaser *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 4-11 refs (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Commercial activities in space represent diverse markets where international competitors will be motivated by economic, technical and political considerations. These considerations are given and discussed. The space station program, industrial participation and the potential benefits of commercial activities in space are described. How food service and nutrition affects habitability, effects on physical condition, dietary goals, food preparation and meal service are detailed. E.R.

N85-24735*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NASA PLANS FOR A SPACE STATION
Clark Covington *In its* Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 12-15 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The rationale for developing a space station is discussed. It is envisioned as a multipurpose facility which can serve a wide range of scientific and technology development activities. Alternative approaches to the space station are also considered. Planning and engineering guidelines are developed. The commercialization of the space station is outlined. E.R.

N85-24736*# Hilton (Conrad N.) Coll. of Hotel and Restaurant Management, Houston, Tex.
FOOD SERVICE MANAGEMENT
Clinton L. Rappole and Sandra A. Louvier (Houston Univ.) *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 16-19 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

A study to design a food service system using current technology to serve a small scale Space Station was conducted. The psychological, sociological and nutritional factors affecting feeding in microgravity conditions was investigated. The logistics of the food service system was defined. E.R.

N85-24737*# Little (Arthur D.), Inc., Cambridge, Mass.
FOOD ACQUISITION: FOOD INGREDIENTS, RAW MATERIALS AND SUPPLY
David W. Wheat *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1984 p 20-22 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The kind of food supply system that will serve the space station in coming years is considered. The direction and rate of evolution of space food service systems is also considered and what is needed to supply appropriate food to space station crews. Innovations in food sourcing, recipe development, pre-preparation, packaging, preservation, presentation, consumption and waste disposal are discussed. The development and validation of preparation systems and ingredients which minimize demands on crew time and provide maximum eating enjoyment is outlined. E.R.

N85-24738*# Brigham Young Univ., Provo, Utah. Dept. of Food Science and Nutrition.
PREPARATION METHODS: PAST AND POTENTIAL METHODS OF FOOD PREPARATION FOR SPACE
Clayton S. Huber *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 23-29 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The logical progression of development of space food systems during the Mercury, Gemini, Apollo, Skylab and Shuttle programs is outlined. The preparation methods which include no preparation to heating, cooling and freezing are reviewed. The introduction of some new and exciting technological advances is proposed, which should result in a system providing crew members with appetizing, safe, nutritious and convenient food. E.R.

N85-24739*# Little (Arthur D.), Inc., Cambridge, Mass.
ALTERNATIVE FOOD PRESERVATION TECHNIQUES, NEW TECHNOLOGY IN FOOD PREPARATION AND APPROPRIATENESS OF FOOD SUPPLY FOR THE PERMANENTLY MANNED SPACE STATION
Richard H. Whelan *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 30-32 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Alternative food preservation techniques are defined as unique processes and combinations of currently used processes for food preservation. Food preservation is the extension of the useful shelf-life of normally perishable foods (from harvest to final consumption) by controlling micro-organisms, enzymes, chemical changes, changes in sensory characteristics and the prevention of subsequent recontamination. The resulting products must comply with all applicable food manufacturing practice regulations and be safe. Most of the foods currently used in both space and military feeding are stabilized either by dehydration or the use of a terminal sterilization process. Other available options would be formulation to reduce water activity, the refrigeration and freezing of perishable foods, chemical addition, and physical treatment (ionizing or nonionizing radiation or mechanical action). These alternatives are considered and proposals made. Author

N85-24740*# Army Natick Research and Development Command, Mass. Science and Advanced Technology Lab.
USE OF IRRADIATED FOODS
Ari Brynjolfsson *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 33-35 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The safety of irradiated foods is reviewed. Guidelines and regulations for processing irradiated foods are considered. The radiolytic products formed in food when it is irradiated and its wholesomeness is discussed. It is concluded that food irradiation processing is not a panacea for all problems in food processing but when properly used will serve the space station well. E.R.

N85-24741*# Enersyst, Inc., Dallas, Tex.
EQUIPMENT FOR HOT-TO-SERVE FOODS
Donald P. Smith *In* NASA. Lyndon B. Johnson Space Center

Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 36-46 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Patented surface heating devices with a much faster air-to-solid heat transfer rate than previous air ovens were developed. The accelerated surface heating can brown, sear or crisp much more rapidly than in conventional ovens so that partially prepared food can be finished quickly and tastefully immediately before serving. The crisp, freshly browned surfaces result from the faster heat transfer which does not dry out the food. The devices are then compared to convection ovens and microwave heating processes. B.G.

N85-24742*# Department of the Army, Washington, D. C.
NUTRITIONAL CRITERIA FOR MILITARY RATIONS AND EFFECTS OF PROLONGED FEEDING ON ACCEPTABILITY
David Schnakenberg *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 47-48 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Broad nutritional policies for operational rations are designed to insure that the nutritional content of the rations served will sustain combat effectiveness. Concern exists that these rations, although nutritionally complete, would become monotonous because of limited variety causing nutrient intake to decrease and body weight losses to occur with adverse effects on morale and combat effectiveness. Whenever possible, troops are now fed one or two hot meals per day containing fresh foods and a much greater variety of foods than are available in packaged rations. A laboratory test was conducted with student volunteers and the results are discussed. B.G.

N85-24743*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NUTRITION IN SPACE FLIGHT: SOME THOUGHTS
Philip C. Johnson, Jr. *In its* Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 49-52 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Space flight causes physiological changes related to microgravity and on which nutrition has a bearing. Examples are: muscle atrophy-protein; bone atrophy-calcium; phosphorus, and vitamin D; space sickness-fat; cardiovascular deconditioning-sodium; water, and potassium. The physiological changes are discussed which relate to living in space. B.G.

N85-24744*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FOOD SERVICE AND NUTRITIONAL NEEDS
Joseph Kerwin *In its* Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 53-55 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The difficulty is that as we go into the Space Station world, the cost, effort, hardware, food trash, and food waste that the food service system will generate (which is quite tolerable on a 7 day mission), probably will be intolerable on a 90 day Space Station mission. The challenge in the food service supply is not so much packaging but systems engineering. The big constraints are in the supply pipeline. Those constraints and the possible tradeoffs are discussed. B.G.

N85-24745*# Little (Arthur D.), Inc., Cambridge, Mass.
PSYCHOBIOLOGY AND FOOD PERCEPTION
Anne Neilson *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 56-58 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Psychobiology is a scientific discipline which encompasses the phenomena known to be important as regards nutrition and food consumption in space. Specifically, it includes those areas of biology which are clearly related to behavior, human subjective experience and problems of coping and adapting to stress. Taste and odor perception; perception (knowledge gaps); perception (needs); food preference and menu selection; and choosing of acceptable diets are discussed. B.G.

N85-24746*# Signode Corp., Glenview, Ill. Corporate Planning and Development Dept.
PACKAGING'S CONTRIBUTION FOR THE EFFECTIVENESS OF THE SPACE STATION'S FOOD SERVICE OPERATION
Bernard A. Rausch *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 59-62 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Storage limitations will have a major effect on space station food service. For example: foods with low bulk density such as ice cream, bread, cake, standard type potato chips and other low density snacks, flaked cereals, etc., will exacerbate the problem of space limitations; package containers are inherently volume consuming and refuse creating; and the useful observation that the optimum package is no package at all leads to the tentative conclusion that the least amount of packaging per unit of food, consistent with storage, aesthetics, preservation, cleanliness, cost and disposal criteria, is the most practical food package for the space station. A series of trade offs may have to be made to arrive at the most appropriate package design for a particular type of food taking all the criteria into account. Some of these trade offs are: single serve vs. bulk; conventional oven vs. microwave oven; nonmetallic aseptically vs. non-aseptically packaged foods; and comparison of aseptic vs. nonaseptic food packages. The advantages and disadvantages are discussed. B.G.

N85-24747*# Little (Arthur D.), Inc., Cambridge, Mass.
PACKAGING FOR FOOD SERVICE
E. Joseph Stilwell *In* NASA. Lyndon B. Johnson Space Center Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 63-66 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

Most of the key areas of concern in packaging the three principle food forms for the space station were covered. It can be generally concluded that there are no significant voids in packaging materials availability or in current packaging technology. However, it must also be concluded that the process by which packaging decisions are made for the space station feeding program will be very synergistic. Packaging selection will depend heavily on the preparation mechanics, the preferred presentation and the achievable disposal systems. It will be important that packaging be considered as an integral part of each decision as these systems are developed. B.G.

N85-24748*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE OPERATIONAL TEST AND SCIENTIFIC INVESTIGATIONS
John C. Stonesifer *In its* Food Serv. and Nutr. for the Space Shuttle Apr. 1985 p 67-73 (For primary document see N85-24733 14-54)
Avail: NTIS HC A05/MF A01 CSCL 06H

The Detailed Test Objectives (DTOs) originated as a test or measurement made to verify the function of a vehicle system for certification of a vehicle system. The Detailed Supplementary Objectives (DSOs) are a demonstration or test which has a lower priority than a DTO. The criteria for inclusion on space shuttle mission is discussed. B.G.

N85-24749*# Computer Sciences Corp., Silver Spring, Md.
PROGRAMMER/ANALYST WORKSTATION EVALUATION REPORT
Rakesh Mital Nov. 1984 103 p refs Presented at 1st Intern. Conf. on Computer Workstations, San Jose, Calif., 11-14 Nov. 1985
(Contract NAS5-27888)
(NASA-CR-175289; NAS 1.26:175289; CSC/TM-84/6138) Avail: NTIS HC A06/MF A01 CSCL 05H

The methodology and results of the programmer/analyst

workstation evaluation undertaken at Computer Sciences Corporation under task assignment 80200 is presented. E.A.K.

N85-24750# Naval Aerospace Medical Research Lab., Pensacola, Fla.
DUAL-TASK TIMESHARING USING A PROJECTED ATTITUDE DISPLAY (MALCOLM HORIZON)
A. H. Bellenkes Nov. 1984 17 p
(M00-96)
(AD-A150789; NAMRL-1310) Avail: NTIS HC A02/MF A01 CSCL 01/4

In order to optimize timesharing and facilitate performance in the high workload environment of the modern cockpit, a peripheral vision horizon device (PVHD) has been developed which can present aircraft attitude data to the visual periphery; an area reported to be highly sensitive to the perception of information regarding orientation in space. A great deal of subjective evidence gathered from simulator and operational test flights has lent support to the efficacy of this device in improving performance. However, this capability has yet to be verified by controlled laboratory testing. Two horizon sizes were evaluated; one with dimensions similar to that found in an aircraft instrument panel and the other extending out to the visual periphery. The objective of this study was to determine whether dual-task performance could be improved by using the large projected horizon vs. a more conventional short horizon. The findings indicated that the PVHD allowed subjects to perform the foveated mental arithmetic task while simultaneously controlling the orientation of the horizon. PVHD root mean square (RMS) error, and mental arithmetic speed/accuracy data were found to be superior when subjects used the extended vs. the short horizon for tracking. These findings suggest that the PVHD permitted individuals to process the two sets of visual information in parallel, thereby improving performance on both. GRA

N85-24751# Army Tropic Test Center APO, Miami 34004.
STREAMLINED TEST REPORTING AND PLANNING (STRAP): COMPUTERIZED HUMAN FACTORS QUESTIONNAIRE Methodology Investigation Report, Jun. - Sep. 1984
L. S. Hay Sep. 1984 28 p
(AD-A150811; USATTC-840905) Avail: NTIS HC A03/MF A01 CSCL 05/2

A computerized program for preparing questionnaires is presented. The computer operator enters the form title and lists of questions which are stored under a unique file name. He later assembles the questionnaire by entering the question variable number and using the appropriate special function key. The final product is letter quality ready for insertion into the test plan. The methodology investigation proposal (MIP) is provided. Work on the computer aided reporting system; the test status information program; and the reliability, availability and maintainability data collection system called for in the MIP will be deferred so that those efforts will fit better into the overall US Army Test and Evaluation Command (TECOM) effort for automating test plans and reports. GRA

N85-24752# Army Research Inst. of Environmental Medicine, Natick, Mass.
CURRENT APPROACHES FOR THE BIOPHYSICAL AND PHYSIOLOGICAL EVALUATION OF COMBAT CLOTHING FOR ENVIRONMENTAL EXTREMES
K. B. Pandolf, R. R. Gonzalez, and M. N. Sawka Feb. 1985 17 p Presented at the 14th Commonwealth Defence Conf. on Operational Clothing and Combat Equipment
(DA Proj. 3E1-62777-A-878)
(AD-A151012; USARIEM-M-18/85) Avail: NTIS HC A02/MF A01 CSCL 15/5

Concerned with studying the soldier, his clothing and equipment, the environment and the interactions which determine thermal stress in hot or cold environments, research studies are designed to provide a basis for predicting the soldier's physiological responses, performance decrements and tolerance times under a given combination of physical activity level, clothing and the environment. The current computerized prediction model considers the interaction of various multidisciplinary factors such as: (1) the theoretical physics of heat transfer, (2) the biophysics of clothing, (3) the physiology of metabolic heat production, distribution and elimination; and, (4) related meteorological parameters. GRA

N85-24040# Joint Publications Research Service, Arlington, Va.
CONTROLLABLE MOVEMENTS OF ELASTIC MANIPULATOR WITH THREE DEGREES OF FREEDOM Abstract Only
A. A. Gukasyan *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 19 Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR: Mekhan. (Yerevan), v. 36, no. 3, Mar. 1983 p 12-20 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24698# Joint Publications Research Service, Arlington, Va.
COMPLEX PROGRAM OF ERGONOMIC STUDIES PILOT DESCRIBED
Andrey Potapenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-012) 25 Mar. 1985 p 1-2 Transl. into ENGLISH from Nedelya (Moscow), 3-9 Dec. 1984 p 4 (For primary document see N85-24697 14-51)
Avail: NTIS HC A08/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-24753 Centre National d'Etudes Spatiales, Toulouse (France). Div. of Space Mathematics.
SPACE MATHEMATICS FOR THE PREPARATION AND DEVELOPMENT OF SATELLITE EXPLOITATION
1984 1167 p refs Partly in ENGLISH and FRENCH Proc. of Course on Space Technol., Toulouse, 1984
(ISBN-2-85428-115-2) Copyright. Avail: CEPADUES, Toulouse, France

Parameter estimation of linear models used in space applications; optimal control and optimization; space trajectory optimization; linear systems analysis; spheroidal functions; finite element methods; numerical analysis; space mechanics; and computer aspects of space mathematics are treated. For individual titles, see N85-24754 through N85-24787.

N85-24754 Centre National d'Etudes Spatiales, Toulouse (France).
PARAMETER ESTIMATION IN STOCHASTIC DYNAMIC SYSTEMS [ESTIMATION DES PARAMETRES DANS LES SYSTEMES DYNAMIQUES STOCHASTIQUES] c65
B. Truong-Van *In its* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 29-64 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Parameter estimation in stochastic dynamic systems using linear regression and maximum likelihood estimates is introduced. Least squares, gradient, Newton, and Kalman filter algorithms are outlined. Author (ESA)

N85-24755 Centre National d'Etudes Spatiales, Toulouse (France).
OPTIMAL CONTROL AND OPTIMIZATION [CONTROLE OPTIMAL ET OPTIMISATION] c63
J. Noailles *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 65-76 refs In FRENCH (For primary document see N85-24753 14-59)

Avail: CEPADUES, Toulouse, France

The existence of solutions to optimal control problems for dynamic linear and dynamic nonlinear cases is shown. The use of maximum principles is outlined. Author (ESA)

N85-24756 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
OPTIMAL SPACE TRAJECTORIES [TRAJECTOIRES SPATIALES OPTIMALES] **c13**
J. P. Marec *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 77-95 refs In FRENCH Original language document was announced in IAA as A84-37529 (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The optimization of rendezvous and transfer orbits is introduced. Optimal transfer is defined and propulsion system modeling is outlined. Parameter optimization, including the Hohmann transfer, is discussed. Optimal transfer in general, uniform, and central gravitational fields is covered. Interplanetary rendezvous is treated. Author (ESA)

N85-24757 Centre National d'Etudes Spatiales, Toulouse (France).
FINITE ELEMENT METHODS IN SPACE MATHEMATICS [SUR LES METHODES D'ELEMENTS FINIS EN MATHEMATIQUES SPATIALES] **c64**
P. Altibelli *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 97-118 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Finite element method basics and computer codes are introduced. Applications to computer aided design of a satellite electrical lay-out (calculation of radioelectric constants in the cabling) and to the study of kinetic growth of semiconductor crystals (modeling and calculation of temperature distribution and gas concentration in an epitaxy reactor) are outlined. Author (ESA)

N85-24758 Centre National d'Etudes Spatiales, Toulouse (France).
SPHEROIDAL FUNCTIONS: PROPERTIES AND TABULATION. APPLICATION TO ANTENNA SYNTHESIS [FONCTIONS SPHEROIDALES PROPRIETES: TABULATION A LA SYNTHESE DES ANTENNES] **c64**
P. Dorio *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 119-161 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The concept of spheroidal coordinates is introduced and the use of polar and equatorial systems in solving the Helmholtz equation is outlined. Calculation methods and computerized algorithms for solving spheroidal equations are summarized. The application of spheroidal functions to synthesis of the law of antenna radiation patterns is illustrated. Author (ESA)

N85-24759 Centre National d'Etudes Spatiales, Toulouse (France).
SOLVING LARGE LINEAR SYSTEMS [RESOLUTION DE GRANDS SYSTEMES LINEAIRES] **c64**
J. L. Lagouanelle *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 163-178 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The solution of systems of n equations with n unknowns by direct and iterative algorithms is introduced. The conjugate gradient method; LU decomposition; splitting; Richardson extrapolation; preconditioning to accelerate convergence; incomplete factorization; and semi-iterative acceleration methods are covered. Author (ESA)

N85-24760 Centre National d'Etudes Spatiales, Toulouse (France).
PROPAGATION OF NUMERICAL ERRORS IN COMPUTERS AND NUMERICAL QUALITY [PROPAGATION DES ERREURS NUMERIQUES DANS LES CALCULATEURS ET QUALITE NUMERIQUE] **c61**
C. Soubry *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 179-191 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The causes of errors in executing numerical algorithms are discussed and the influence of each error factor is considered. Problems linked to representation and conversion of numbers and to elementary operations of floating point arithmetic are outlined. Machine addition of N representable numbers is studied to show the influence of the programming of an algorithm on the numerical result. Quality control of numerical resuls; numerical reliability of software; portability; and program verification are treated. Author (ESA)

N85-24761 Centre National d'Etudes Spatiales, Toulouse (France).
ARITHMETIC AND ELEMENTARY FUNCTIONS ON MINI AND MICROCOMPUTERS [ARITHMETIQUE ET FONCTIONS ELEMENTAIRES SUR MINI-MICRO COMPUTERS] **c64**
J. C. Berges *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 193-229 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Elementary function tests were developed after trials of a SOLAR 16/65 computer revealed insufficient accuracy in the sin, cos, tan, root, arcsin, arcos, arctan, exponential and logarithmic functions. Application of the tests to the tan (x) function is outlined. The tests enabled the system to be improved to give a relative error 50 times less important, and to cut calculation time by 59%. Author (ESA)

N85-24762 Centre National d'Etudes Spatiales, Toulouse (France).
ELEMENTS OF CELESTIAL MECHANICS [ELEMENTS DE MECANIQUE CELESTE] **c90**
Francois Nouel *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 231-266 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Newtonian, Lagrange, and Hamiltonian mechanics are introduced. Motion of one and n particles; orbit parameters; Riemann variety associated with dynamic systems; dynamic systems with constraints; perturbation theory; canonical equations; canonical transformations; Hamilton principle and Lagrange equation; and the Hamilton-Jacobi theory are covered. Author (ESA)

N85-24763 Centre National d'Etudes Spatiales, Toulouse (France).
ORBIT PERTURBATION. EXTRAPOLATION OF PERTURBED ORBITS [PERTURBATIONS D'ORBITES. EXTRAPOLATION D'ORBITES PERTURBEES] **c13**
O. Zarrouati *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 267-439 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The mechanics of satellite orbits perturbed by gravitational and other forces is introduced. For each category, the principle perturbing agents are described and the methods used to evaluate them numerically are summarized. Geosynchronous orbits are examined. Numerical integration of satellite equations of motion is outlined. Author (ESA)

N85-24764 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherches de Geodesie Spatiale.
POTENTIAL MODELS [MODELS DE POTENTIAL] **c13**
G. Balmino *In its* Space Math. for the Prepn. and the Develo. of Satellite Exploit. 1984 p 441-467 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Spherical harmonics models of the Earth's gravitational potential are introduced. The utilization of orbit perturbation and surface data to construct the models is summarized. Comparison of geopotential models suggests that they are not accurate enough for geophysical and oceanographic satellite orbit determination, for studying the ocean geoid, or for geophysical studies in continental regions where gravity is only known through trajectory analysis. Author (ESA)

N85-24765 Centre National d'Etudes Spatiales, Toulouse (France).
ORBIT RECONSTITUTION [RESTITUTION D'ORBITE] c13
D. Zobler *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 469-499 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The derivation of a satellite orbit from information concerning its position and/or velocity is introduced. A Gauss-Newton algorithm for global solution of the problem is presented. Calibration of interferometric, photographic, and S band radar systems used to measure distances and directions is outlined. Author (ESA)

N85-24766 Centre National d'Etudes Spatiales, Toulouse (France).
MODELING NEEDED FOR THE DESIGN AND DEFINITION OF SPACECRAFT ATTITUDE AND ORBIT CONTROL SYSTEMS [MODELISATIONS NECESSAIRES A LA CONCEPTION ET LA DEFINITION DES SYSTEMES DE COMMANDE D'ATTITUDE ET D'ORBITE DES VEHICULES SPATIAUX] c18
Paul Duchon *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 501-535 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Reference systems, kinetic equations, and equations of motion around a center of mass used in satellite attitude control system design are introduced. Coupled and perturbing forces are described. Gravitational effects and the effects of outside forces (aerodynamic drag, magnetic effects, Foucault currents, solar radiation) are assessed. Modeling of spin stabilization is illustrated. Author (ESA)

N85-24767 Centre National d'Etudes Spatiales, Toulouse (France).
ATTITUDE MEASUREMENTS AND DETERMINATION [MESURES ET RESTITUTION D'ATTITUDE] c13
J. Foliard *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 537-590 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Satellite attitude determination using an inertial reference system is explained. The utility of being able to determine attitude is outlined. Construction of an attitude matrix from the Euler and Cardan angles of the satellite-Earth system is illustrated. Static and dynamic analysis methods are shown. The sensors employed when using the Sun, Earth's magnetic field, the Earth, and the stars as reference direction are described. Author (ESA)

N85-24768 Institut Geographique National, Paris (France).
LOCATION AND SYNCHRONIZATION [LOCALISATION ET SYNCHRONISATION] c13
C. LeCocq *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 591-611 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Methods of determining the space and time coordinates of a point are summarized. Two and three dimensional coordinate systems; and ground based and spaceborne measurements are described. Time scales, and synchronization by clock transfer, terrestrial radio links, LORAN C, satellite, and television are outlined. Author (ESA)

N85-24769 Centre National d'Etudes Spatiales, Toulouse (France).
SPACEBORNE AUTOMATIC DATA PROCESSING [AUTOMATIQUE SPATIALE] c61
M. Maurette *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 613-619 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Real time onboard data processing by satellite-borne computers is discussed. Orbital control and guidance are considered. Attitude control of rigid, spinning, three-axis stabilized, and flexible satellites is described. Robotics and the development of spaceborne automation are mentioned. Author (ESA)

N85-24770 Centre National d'Etudes Spatiales, Toulouse (France).
THE COMPUTING FACILITIES OF THE TOULOUSE SPACE CENTER [LES MOYENS INFORMATIQUES DU CST] c62
A. Dargent *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 621-639 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The hardware, software, and services available at the computing center of the French Space Agency are described. The system is based on CDC Cyber 170-750 machines with interactive and batch processing terminals, and telephone links. Paper, 35 mm film, and microfiche printouts are possible. Author (ESA)

N85-24771 Centre National d'Etudes Spatiales, Toulouse (France).
INTRODUCTION TO METHODS OF EVALUATING THE OPERATIONAL RELIABILITY OF COMPLEX SYSTEMS: APPLICATION TO SATELLITE CONTROL GROUND SUPPORT [UNE INTRODUCTION AUX METHODES D'EVALUATION DE LA SURETE DE FONCTIONNEMENT DES SYSTEMES COMPLEXES: APPLICATION AUX SEGMENTS SOL DE CONTROLE DES SATELLITES] c38
P. A. Ricard *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 641-669 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Satellite ground support system reliability modeling is introduced. The laws of probability and the properties of Markov processes involved in the models are presented. The analysis of the Telecom-1 satellite computer system is illustrated. Author (ESA)

N85-24772 Centre National d'Etudes Spatiales, Toulouse (France).
ORBITAL POSITIONING AND STATIONKEEPING OF GEOSTATIONARY SATELLITES [MISE ET MAINTIEN A POSTE DES SATELLITES GEOSTATIONNAIRES] c13
H. Donat *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 673-746 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Orbit, launcher, and satellite related constraints on launch windows are reviewed. The flight sequence and orbital position optimization of spin and three axis stabilized satellites are described. Geostationary orbit perturbations and evolution, and orbit correction are considered. North-south and east-west stationkeeping strategies are outlined. Stationkeeping of Telecom-1 and TDF-1 is illustrated. Author (ESA)

N85-24773 Centre National d'Etudes Spatiales, Toulouse (France).
MISSION ANALYSIS AND ORBIT CONTROL OF THE HELIOSYNCHRONOUS SATELLITE SPOT [ANALYSE MISSION: MAINTIEN ET CHANGEMENT D'ORBITE DE SPOT 1] c15
H. Cerbelaud *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1985 p 747-809 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The SPOT satellite multispectral and panchromatic Earth imaging mission is outlined, and the influence of mission constraints on orbit parameters is discussed. The effects of geopotential variations, Moon-Sun magnetic fields, and atmospheric friction on the satellite trajectory are analyzed. Stationkeeping and orbital maneuvers are described. Author (ESA)

N85-24774 Centre National d'Etudes Spatiales, Toulouse (France).
NATURAL REENTRY OF SATELLITES [RENTREE NATURELLE DES SATELLITES] c15
P. Escudier *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 811-842 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Parameters used to characterize atmospheric friction effects on satellite orbits are outlined, and the secular evolution of orbit parameters throughout satellite lifetime is traced. Reentry into the dense layers of the atmosphere is described. Author (ESA)

N85-24775 Centre National d'Etudes Spatiales, Toulouse (France).
THE ARGOS PROGRAM [LE PROGRAMME ARGOS] c15
M. Taillade and D. Ludwig *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 843-864 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The ARGOS satellite based localization system is described. The user platform weighs only 2 kg, so can be carried by a wide range of targets, e.g., balloons, icebergs or animals. The platforms are linked to NOAA satellites, which act as relay stations for platform and satellite environmental and experiment data. Special ground stations were built for direct data collection. The localization system is based on Doppler positioning, with 60% of platforms located at each satellite passage. Accuracy is within 100 m. The data processing system assures 99% availability of data; 66% of the data are available < 3 hr after measurement, 87.5% < 6 hr. Information includes raw and converted sensor data, and position, speed, and last localization date of platforms. Real time data transmission is assured by the Global Telecommunication System. Data are used in atmospheric science, oceanography and Earth sciences. Author (ESA)

N85-24776 Centre National d'Etudes Spatiales, Toulouse (France).
THE SARSAT/COSPAS SYSTEM FOR ASSISTING SATELLITE BASED SEARCH AND RESCUE [SARSAT/COSPAS, UN SYSTEME D'AIDE A LA RECHERCHE ET AU SAUVETAGE PAR SATELLITE] c16
D. Ludwig and Ph. Goudy *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 865-874 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The SARSAT/COSPAS satellite network uses 121.5 and 406 MHz buoys to locate ships and aircraft in distress. The 121.5 MHz system, obligatory on many aircraft, gives localization to within 10 km, and, despite being subject to considerable radio interference and a poor signal to noise ratio, is responsible for saving nearly 200 lives. The 406 MHz location error is < 2 km in 75% of cases, and < 2 hr for 95% of cases in the worst conditions. It suffers however from interference from illegal broadcasts in the frequency band. Author (ESA)

N85-24777 Belgian Royal Observatory, Uccle.
THE TRANSIT AND GLOBAL POSITIONING SYSTEM (GPS) SYSTEMS. PRECISION NAVIGATION AND LOCALIZATION [LES SYSTEMES TRANSIT ET GPS. NAVIGATION ET LOCALISATION DE PRECISION] c17
M. P. Paquet *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 875-904 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The general principles of space navigation are summarized and tropospheric and ionospheric perturbation of satellite signals is described. The use of the Doppler effect by the TRANSIT and Global Positioning System (GPS) networks to derive the coordinates of a ground target is outlined. Processing of the measurement data is explained. For navigation, the GPS is the better system, since it provides an instantaneous position; TRANSIT gives better results for absolute positioning. Author (ESA)

N85-24778 Centre National d'Etudes Spatiales, Toulouse (France).
CLOCK SYNCHRONIZATION BY THE SYMPHONIE AND LASER SYNCHRONIZATION FROM STATIONARY ORBIT (LASSO) GEOSTATIONARY SATELLITES [SYNCHRONISATION D'HORLOGES PAR SATELLITES GEOSTATIONAIRES SYMPHONIE, LASSO] c35
Michel Brunet *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 905-933 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The use of atomic clocks is described, and the use of satellites to assure their intercontinental synchronization is discussed. The Symphonie satellites assure a transatlantic (France-Canada) synchronization in the 4 to 6 GHz band with nanosec accuracy. Atmospheric and relativistic effects are corrected to within 5 nsec, but instrument delay calibration remains a problem. The Laser Synchronization from Stationary Orbit (LASSO) experiment is based on the measurement of the time it takes a laser pulse to complete the return journey from a ground station to the satellite. The LASSO was designed for the SIRIO-2 satellite, whose launch failed, and is now proposed for Meteosat-2. Author (ESA)

N85-24779 Centre National d'Etudes Spatiales, Toulouse (France).
SCIENTIFIC EXPERIMENTS. PREPROCESSING OF SCIENTIFIC DATA [LES EXPERIENCES SCIENTIFIQUES. PRETRAITEMENT DES DONNEES SCIENTIFIQUES] c43
Michel Avignon *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 935-981 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Preprocessing of satellite-borne experiment data for space-borne astronomy, geophysics, planetology, geodesy, oceanography, Earth observations, technology, and medicine and biology projects is introduced. The data acquisition chain is described. Passage from raw data to instrument data; calibrating; data sampling; passage from instrument to physically significant data; levels of processing; and data storage and access are outlined. Examples of ocean circulation and sea state, GEOS magnetospheric wave, and gamma ray astronomy data preprocessing are given. Author (ESA)

N85-24780 Centre National d'Etudes Spatiales, Toulouse (France).
SYNTHETIC APERTURE RADAR DATA PROCESSING [TRAITEMENT DES DONNEES DU RADAR A SYNTHESE D'OUVERTURE] c32
M. D. Vaillant *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 983-1013 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The principles of synthetic aperture radar (SAR) are introduced, and the SAR on board aircraft or satellites is described. Preprocessing of SAR data, including optical processing, choice of hardware and software, radiometric and geometric rectification, and calibrating is introduced. Direct and spectral utilization of SAR imagery is summarized. Author (ESA)

N85-24781* Orbital Sciences Corp., Vienna, Va.
INTERPLANETARY NAVIGATION c17
James R. Stuart *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1015-1038 refs (For primary document see N85-24753 14-59)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 17B

The evolution of NASA's planetary navigation techniques is traced, and radiometric and optical data types are described. Doppler navigation; the Deep Space Network; differenced two-way range techniques; differential very long base interferometry; and optical navigation are treated. The Doppler system enables a spacecraft in cruise at high absolute declination to be located within a total angular uncertainty of 1/4 microrad. The two-station range measurement provides a 1 microrad backup at low declinations. Optical data locate the spacecraft relative to the target to an angular accuracy of 5 microrad. Earth-based radio navigation and its less accurate but target-relative counterpart, optical navigation, thus form complementary measurement sources, which provide a powerful sensory system to produce high-precision orbit estimates. Author (ESA)

N85-24782 Bureau des Longitudes, Paris (France).
THE SOLAR SYSTEM: IMPROVING KNOWLEDGE OF THE SYSTEM [LE SYSTEME SOLAIRE: AMELIORATION DE LA CONNAISSANCE DU SYSTEME] c90
B. Morando *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1039-1049 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Classical and contempory theories on the integration of the

motions of bodies in the solar system are recalled. Ephemerides of solar system bodies based on Tchbychev polynomials, available on magnetic tape, are reported. Author (ESA)

N85-24783 European Space Agency. European Space Operations Center, Darmstadt (West Germany).
TOWARDS THE HALLEY COMET c91
G. Janin *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1051-1071 refs (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Mathematical tools for mission analysis of interplanetary flights are reviewed. Methods for solving the boundary value problem defined by the interplanetary transfer are recalled: single and patched conics; matched asymptotic expansions; and shooting methods. For the precise numerical integration of trajectories, formulations of the differential equations of motion are described as well as methods for integrating ordinary differential equations. Performances of the European launcher for escape missions are presented. Applications to the Giotto mission for direct injection and injection from an elliptic parking orbit are illustrated. Author (ESA)

N85-24784 Institut Geographique National, Paris (France).
REFERENCE SYSTEMS [LES SYSTEMES DE REFERENCE] c13
C. Boucher *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1073-1092 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Terrestrial and inertial reference systems based on Newtonian physics are introduced. Techniques for determining the coordinates of points in terrestrial reference systems are reviewed. Classical geodesy; satellite laser and Doppler methods; laser-Moon measurements; and very long base interferometry are described. Author (ESA)

N85-24785 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherche de Geodesie Spatiale.
EARTH ROTATION AND POLAR WANDERING [LA ROTATION DE LA TERRE ET LE MOUVEMENT DU POLE] c46
Richard Biancale *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1093-1116 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Studies of Earth rotation and polar wandering are recalled. The Liouville equations used to parameterize Earth movements are presented. Methods used to determine Earth rotation and movements of the poles (astrometry, TRANSIT satellites, LAGEOS, very long base interferometry) are listed. Determination of Universal Time is discussed. Author (ESA)

N85-24786 Centre National d'Etudes Spatiales, Toulouse (France). Groupe de Recherche de Geodesie Spatiale.
THE MEDOC 2: EXPERIMENTAL DOPPLER MEASUREMENT OF EARTH KINEMATICS [LE PROJET MEDOC 2: MESURE EXPERIMENTALE PAR DOPPLER DE LA CINEMATIQUE TERRESTRE] c46
Alfred Piuzzi *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1117-1148 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

The MEDOC project to create a worldwide reference system via a satellite tracking network with accuracy better than 1 m for the three components, and to regularly calculate the movement of the Earth's axis of rotation with 20 cm per day accuracy is presented. The project is based on the TRANSIT system. The ground stations, hardware, software, data transmission, algorithms, and Earth model used are described. Exploitation of the results is discussed. Author (ESA)

N85-24787 Observatoire de Paris-Meudon (France).
MATERIALIZATION OF A REFERENCE SYSTEM VIA A STAR CATALOG [MATERIALISATION D'UN SYSTEME DE REFERENCE PAR UN CATALOG D'ETOILES] c89
Catherine Turon-Lacarrieu *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1149-1167 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

Dynamic and kinematic reference system construction is introduced. Astronomical catalogs, including FK4, FK5, and NGC are described. The HIPPARCOS satellite astrometry project is outlined and connection of the HIPPARCOS reference frame to a very long base interferometry system is summarized. Author (ESA)

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-24788 George Washington Univ., Washington, D.C.
EVALUATING THE APPROPRIATENESS OF MICROCOMPUTERS FOR LITIGATION DOCUMENT MANAGEMENT USING THE ANALYTIC HIERARCHY PROCESS Ph.D. Thesis
Hussein A. Amin 1984 229 p
Avail: Univ. Microfilms Order No. DA8428944

Attorneys involved in large cases have availed themselves of mainframe computers for speed and ease in document management. A modifiable evaluative methodology was developed that would enable a small to mid-sized law firm to evaluate whether the microcomputer, as compared to the manual method, could economically and technically manage case-related documents involved in its litigation support efforts. The Analytic Hierarchy Process (AHP) was applied to develop this evaluative methodology. The requirements of a litigation document management system were researched and specifications for the microcomputer and manual methods of necessary document management were developed. Expert Choice, a software package was used for automating the AHP. Data collection was accomplished through a questionnaire sent to size-relevant law firms, interviews with litigation support consultants, and working sessions with selected lawyers. Dissert. Abstr.

N85-24789 Purdue Univ., Lafayette, Ind.
STUDIES IN PARALLEL IMAGE PROCESSING Ph.D. Thesis
Gie-Ming Lin 1984 179 p
Avail: Univ. Microfilms Order No. DA8500403

The supervised relaxation operator combines the information from multiple ancillary data sources with the information from multispectral remote sensing image data and spatial context. Iterative calculations integrate information from the various sources, reaching a balance in consistency between these sources of information. The supervised relaxation operator is shown to produce substantial improvements in classification accuracy compared to the accuracy produced by the conventional maximum likelihood classifier using spectral data only. Improvement in classification accuracy by means of supervised relaxation comes at a high price in terms of computation. In order to overcome the computation-intensive problem, a distributed/parallel implementation is adopted to take advantage of a high degree of inherent parallelism in the algorithm. To accomplish this, first, a graphical modeling and analysis method is described for algorithms implemented using the SIMD mode of parallelism. Second, the comparison of execution times between SIMD and MIMD modes is discussed, based on the analysis of implicit and explicit operations embedded in an algorithm. Dissert. Abstr.

N85-24790# Rochester Univ., N. Y. Dept. of Computer Science.
RELIABLE COMPUTATION WITH CELLULAR AUTOMATA
P. Gacs 1985 58 p
(Contract N00014-82-K-0193; Grants NSF MCS-81-04006; NSF

MCS-83-02874)
(AD-A150656; TR-132) Avail: NTIS HC A04/MF A01 CSCL 09/2

In this document the author constructs a one-dimensional array of cellular automata on which arbitrarily large computations can be implemented reliably, even though each automation at each step makes an error with some constant probability. In statistical mechanics, this construction leads to the refutation of the positive probability conjecture, which states that any one-dimensional infinite particle system with positive transition probabilities is ergodic. To compute reliably with unreliable components, von Neumann proposed Boolean circuits whose intricate interconnection pattern (arising from the error-correcting organization) he had to assume to be immune to errors. In a uniform cellular medium, the error-correcting organization exists only in software, therefore errors threaten to disable it. The real technical novelty of the paper is therefore the construction of a self-repairing organization. GRA

N85-24791# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A TWO-CYCLE SHIFT REGISTER WITH ERROR DETECTION
R. E. Gut and V. B. Pogodin 13 Dec. 1984 9 p Transl. into ENGLISH from Russian Patent no. 38304823 (May 1973) p 1-4 p 1-4
(AD-A150768; FTD-ID(RS)T-0558-84) Avail: NTIS HC A02/MF A01 CSCL 09/2

The invention pertains to the area of computer technology. Single-crystal registers with error detection are known. However, in them the error detection block is suitable only for the class of single-cycle registers. Also known are two-cycle shift registers in which the emergence of undetected errors is possible. In the proposed two-cycle register, to increase the reliability of error detection the first outputs of the primary and auxiliary flip-flop of each digit are connected with the inputs of one element, EXCLUSIVE-OR, the output of which is connected with input of the first element OR, the second outputs of the main flip-flop of each digit and the auxiliary flip-flop of the following digit are connected with the inputs of each element EXCLUSIVE-OR, the output of which is connected with the input of the second element OR, the outputs of elements OR, are connected with the input of the element AND which corresponds to it, the other input of which is connected with output of the additional flip-flop, the inputs of which are connected with the main and auxiliary clock bus, and the outputs of element AND are connected to the inputs of the third element OR. GRA

N85-24792# National Bureau of Standards, Washington, D.C.
THE EFFECT OF COMPUTERS ON THE GENERATION AND USE OF TECHNICAL DATA
D. R. Lide, Jr., ed. Jun. 1984 58 p refs Workshop held at Gaithersburg, Md., 19-20 Mar. 1984
(NBSIR-84/2907; TI85-900635) Avail: NTIS HC A04/MF A01

Changes in the generation, dissemination, and use patterns of scientific and technical data which are occurring as a result of the widespread introduction of computers were examined. Comprehensive, reliable data bases covering physical, chemical, and mechanical properties of substances and materials form an essential resource for U.S. industry. Such data play a key role in research, development, engineering design, and process control. Modern computer technology has already had a profound effect on the way engineers do their work and on the way data are analyzed and organized; CAD/CAM techniques have proved their value in many industries, and computer graphics has become a powerful tool. The advantages of using computer/telecommunication techniques for transfer of data from data bases to the user's program are also discussed. Author

N85-24793# National Bureau of Standards, Gaithersburg, Md. Center for Programming Science and Technology.
SECURITY OF PERSONAL COMPUTER SYSTEMS: A MANAGEMENT GUIDE Final Report
D. D. Steinauer Jan. 1985 66 p refs
(PB85-161040; NBS/SP-500/120; LC-84-601156) Avail: NTIS HC A04/MF A01; also available SOD HC as SN003-003-02627-1 CSCL 09B

This document is a security guide for managers and users of personal computer systems. It describes the nature of information security problems involved in the use of personal and other small computer systems and provides guidance for addressing those problems. GRA

N85-24794# Joint Publications Research Service, Arlington, Va.
USSR REPORT: CYBERNETICS, COMPUTERS, AND AUTOMATION TECHNOLOGY
4 Mar. 1985 9 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UCC-85-002) Avail: NTIS HC A05

This U.S.S.R. report contains research relating to cybernetics computers and automation technology. Subject matter covered includes: (1) personal computers; (2) hardware; and (3) software development. For individual titles, see N85-24795 through N85-24802.

N85-24795# Joint Publications Research Service, Arlington, Va.
THE PROBLEM OF CREATING A STANDARDIZED SERIES OF PERSONAL COMPUTERS
V. S. Mikhalevich and B. N. Malinovskiy *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 3-11 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 3-7 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

The potential demand for personal computers is extraordinarily great and their use must yield substantial economic impact. Unfortunately, the development of personal computers that is being conducted at the present time is being poorly coordinated and the personal computers that are being produced by industry do not possess a sufficient degree of compatibility. The planned nature of a socialist national economy and the necessity for optimum use of available resources exclude the need for creating a large quantity of types of personal computers that are approximately identical in their possibilities. An attempt is made to substantiate the necessity and to show ways for developing a standardized series of personal computers. The technical solutions and software realms would be oriented towards organizing the work places of specialists with various specializations, e.g., administrations, researchers, economists, engineers, designers, as well as everyday applications. B.W.

N85-24796# Joint Publications Research Service, Arlington, Va.
USE OF FUNCTION PROCESSORS IN MULTIPROCESSOR SYSTEMS
A. V. Anisimov, A. V. Kraynikov, B. A. Kurdikov, and V. B. Smolov *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 15-18 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 5, May 1984 p 39-42 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

The organization of multiple variable function computation in multiprocessor systems is analyzed. Transmission of initial data to the processor solving the task at hand is proposed via a memory register array whose functions are similar to those of a list of formal subprogram parameters. The advisability of incorporating an integral matrix multiplier in the processor used for computing multiple variable functions is indicated. Author

N85-24797# Joint Publications Research Service, Arlington, Va.
BIPOLAR NONSWITCHING LOGIC ARRAYS: UNIVERSAL COMPONENTS OF FUNCTION EXPANDERS FOR COMPUTATION OF ELEMENTARY FUNCTIONS
V. D. Baykov and A. I. Krys *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 19-25 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 5, May 1984 p 48-53

(For primary document see N85-24794 14-60)
Avail: NTIS HC A05

Two versions of the design of function expanders intended for digit by digit calculation of elementary functions in Series K1804 microprocessor devices (MD) and in bipolar nonswitching logic arrays (NLA) are examined. Specific rated values are given for equipment, time, energy and cost factors in the design and production of both types of function expanders. The advantages of functional processor production based on the NLA variation are indicated in comparison to the MD version. Author

N85-24798# Joint Publications Research Service, Arlington, Va.
EXECUTION OF CELLULAR LOGIC OPERATIONS IN SPATIALLY CONTINUOUS, BIT SLICE PROCESSOR
V. M. Denisov, Yu. N. Matveyev, and Ye. F. Ochin *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 26-31 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 5, May 1984 p 53-56 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

The representation of multilevel images by spatially continuous bit slices is introduced. The algorithm for executing cellular logic operations in the case of such images is examined. Author

N85-24799# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF CONVEYOR PROCESSING OF VECTOR COMMANDS IN MULTIPROCESSOR COMPUTER SYSTEMS WITH A REORGANIZABLE STRUCTURE c61
A. A. Zabolotnyy, V. M. Kostelyanskiy, G. M. Lekhnova, and D. A. Nedzelskiy *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 32-42 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 16-21 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

Multiprocessor computer systems (MVS) with a reorganizable structure of the PS-3000 type are one of the new trends in the development of MVS. The basic features of the MVS are discussed. The effectiveness of pipeline processing of vector commands is examined and analytically researched with regard to interrupts of the vector command pipeline and the various dumping disciplines of requests for servicing, as well as the structural and algorithmic aids that make it possible to provide effectiveness estimates that are close to the maximum ones with limited hardware. B.W.

N85-24800# Joint Publications Research Service, Arlington, Va.
SYSTEMS DESIGN AND APPLICATION OF COMPUTERS WITH FLEXIBLE ARCHITECTURE
A. V. Palagin, A. F. Kurgayev, and A. G. Rokitskiy *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 43-58 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 26-31 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

The dynamics of formulating tasks that are being solved demands a certain redundancy of computer components, and, moreover, the introduction of functional redundancy, i.e., the potential capability to alter and expand its functions, is necessary right along with the redundancy of hardware and parameters (memory, complex of external units; speed, reliability). The combined use of standard devices from various families of computers improves the quality of the automation systems that are being created or reconfigured, as well as accelerating the process of designing them. A new class of computer aflexible architecture computer (EVMGA) that is capable of implementing in real time through hardware and microprogramming the architectures of different computers is examined. The flexibility of architecture of a computer that is complete is compared with the architecture of one that is being implemented. B.W.

N85-24801# Joint Publications Research Service, Arlington, Va.
GRAFIT LANGUAGE FOR SIMULATING TWO-DIMENSIONAL GEOMETRIC ENTITIES AND SKETCHES c61
V. G. Sirotin *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 62-67 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 79-80 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

The GRAFIT language is described which is designed for use in computer aided systems that are oriented towards design and industrial preparation in machine building. Models of two dimensional (2D) and so called 2 1/2 dimensional (2 1/2D) geometric entities and sketches are being built by means of the GRAFIT language in a computer's memory. Entities that can be interpreted as two dimensional for example, solids of revolution - are 2 1/2D entities. The GRAFIT language can be used both by systems and applied programmers (during the development of SAPR [computer aided design systems] and SATPP [computer aided industrial production engineering systems] and directly by designers and nonprogrammers (for describing sketches of components). B.W.

N85-24802# Joint Publications Research Service, Arlington, Va.
AUTOMATION OF DEVELOPMENT OF SOFTWARE FOR SWITCHING UNITS THAT ARE IMPLEMENTED IN THE FORM OF MULTIPROCESSOR SYSTEMS ON A MICROCOMPUTER BASE c61
G. R. Ovchinnikov, Yu. D. Yurakov, and A. G. Dmitriyev *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 68-77 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 41-44; 125 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

At the present time microcomputers, which in a number of instances are united with multiprocessor and multicomputer control systems for improving reliability and performance as well as for expanding functional resources, are widely used for building switching units in communications engineering. Problems of developing software (PO) occur during the creation of systems like this. Series microcomputers have limited resident means for programming and debugging. As a rule, programming languages, if they're also included in the resident software, are low level languages and they don't have appropriate analogs in multipurpose computers. An automated program debugging system (ASO), was created for improving the debugging effectiveness of software that is being developed. The basic principles of building an automated program debugging system are discussed. The results of using it for planning the software of switching units for data transmission systems are also discussed. B.W.

N85-24997*# Asimov (Isaac), Boston, Mass.
OUR FUTURE IN THE COSMOS: COMPUTERS
Isaac Asimov *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 58-75 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-24803 Ohio State Univ., Columbus.
THE IDENTIFICATION OF SEMANTICS FOR THE FILE/DATABASE PROBLEM DOMAIN AND THEIR USE IN A TEMPLATE-BASED SOFTWARE ENVIRONMENT Ph.D. Thesis
Charles John Shubra 1984 427 p
Avail: Univ. Microfilms Order No. DA8426480

Software development needs to follow a disciplined engineering approach so that past programming experience can be used effectively. Software components that capture programming knowledge and experience in a reusable form and are capable of

solving a range of application problems are often seen as a step in such an engineering approach. The discovery and organization of knowledge based on existing software experience from the file/database problem domain are addressed. A model of the file/database problem domain that identifies fundamental concepts and relationships is developed. This model is the basis for analysis techniques employed in a case study of forty production programs collected from two industrial sources. Seventeen commonly occurring patterns of programming are identified. Terminology is defined that describes the characteristics and relationships of the operations and objects present in each pattern. Dissert. Abstr.

N85-24804 Purdue Univ., Lafayette, Ind.
INTEGRATION OF SOLID MODELING AND DATABASE MANAGEMENT FOR CAD/CAM Ph.D. Thesis
Yung-Chia Lee 1984 184 p
Avail: Univ. Microfilms Order No. DA8500398

Focusing on geometric completeness and data independence respectively, solid modeling and database management could be bridged together so as to provide a CAD/CAM environment with a unified geometric database for multiple application uses. The proposed approach is based on the CSG (constructive solid geometry) scheme for solid modeling and the generic relational model for database management, primarily for the purpose of data conciseness while obeying a rigorous database design discipline. To facilitate data scheme definition, a systematic procedure as devised to convert a set of grammar rules into a generic scheme. A relational query language, SEQUEL, was modified to define, control, and manipulate the flat relations which represent the highly structural generic relational model. To further justify the usefulness of the proposed geometric database management system as well as its supporting query language, two application issues, namely, a solid modeler for CAD and a preprocessor for CAM, were also investigated. The solid modeler that was implemented not only acts as an application to be interfaced by the query language but also serves as a tool to visually verify the geometric data.
Dissert. Abstr.

N85-24805*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE MULTIMISSION IMAGE PROCESSING LABORATORY'S VIRTUAL FRAME BUFFER INTERFACE
T. Wolfe 15 Dec. 1984 94 p
(Contract NAS7-918)
(NASA-CR-175655; JPL-PUBL-84-89; NAS 1.26:175655) Avail: NTIS HC A05/MF A01 CSCL 09B

Large image processing systems use multiple frame buffers with differing architectures and vendor supplied interfaces. This variety of architectures and interfaces creates software development, maintenance and portability problems for application programs. Several machine-dependent graphics standards such as ANSI Core and GKS are available, but none of them are adequate for image processing. Therefore, the Multimission Image Processing laboratory project has implemented a programmer level virtual frame buffer interface. This interface makes all frame buffers appear as a generic frame buffer with a specified set of characteristics. This document defines the virtual frame uffer interface and provides information such as FORTRAN subroutine definitions, frame buffer characteristics, sample programs, etc. It is intended to be used by application programmers and system programmers who are adding new frame buffers to a system. Author

N85-24806*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLOWCHARTING WITH D-CHARTS
Don Meyer 15 Jan. 1985 39 p refs
(Contract NAS7-918)
(NASA-CR-175641; JPL-Pub-84-99; NAS 1.26:175641) Avail: NTIS HC A03/MF A01 CSCL 09B

A D-Chart is a style of flowchart using control symbols highly appropriate to modern structured programming languages. The intent of a D-Chart is to provide a clear and concise one-for-one mapping of control symbols to high-level language constructs for purposes of design and documentation. The notation lends itself to both high-level and code-level algorithmic description. The various issues that may arise when representing, in D-Chart style, algorithms expressed in the more popular high-level languages are addressed. In particular, the peculiarities of mapping control constructs for Ada, PASCAL, FORTRAN 77, C, PL/I, Jovial J73, HAL/S, and Algol are discussed. M.G.

N85-24807*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EXPERT SYSTEM FOR CHOOSING THE BEST COMBINATION OF OPTIONS IN A GENERAL-PURPOSE PROGRAM FOR AUTOMATED DESIGN SYNTHESIS
James L. Rogers, Jr. and Jean-Francois M. Barthelemy Mar. 1985 8 p refs Proposed for presentation at the 1985 Inter. Computers in Eng. Conf., Boston, 4-8 Aug. 1985
(NASA-TM-86329; NAS 1.15:86329) Avail: NTIS HC A02/MF A01 CSCL 09B

An expert system was developed to aid a user of the Automated Design Synthesis (ADS) general-purpose optimization computer program in selecting the best combination of strategy, optimizer, and one-dimensional search options for solving a problem. There are approximately 100 such combinations available in ADS. The knowledge base contains over 200 rules, and is divided into three categories: constrained problems, unconstrained problems, and constrained problems treated as unconstrained problems. The inference engine is written in LISP and is available on DEC-VAX and IBM PC/XT computers. M.G.

N85-24808*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GUIDELINES FOR DEVELOPMENT STRUCTURED FORTRAN PROGRAMS
B. M. Earnest Mar. 1984 36 p refs
(NASA-TM-86407; N-38; NAS 1.15:86407) Avail: NTIS HC A03/MF A01 CSCL 09B

Computer programming and coding standards were compiled to serve as guidelines for the uniform writing of FORTRAN 77 programs at NASA Langley. Software development philosophy, documentation, general coding conventions, and specific FORTRAN coding constraints are discussed. Author

N85-24809# Council for Scientific and Industrial Research, Pretoria (South Africa). Technical Services Dept.
MINI-SEMINAR ON CAD/CAM
Aug. 1983 36 p Seminar held in Pretoria, 7 Sep. and 26 Oct. 1983
(CSIR-TSD-0007/83; ISBN-0-7988-2602-9) Avail: NTIS HC A03/MF A01

Various topics concerned with the utilization of computer-aided design and manufacturing (CAD/CAM) are addressed. Specifically, the use of a 3-D system for civil engineering, the justification works, and selection criteria for a CAD/CAM system are discussed. For individual titles, see N85-24810 through N85-24811.

N85-24810# IBM S.A. Proprietary Ltd., Johannesburg (South Africa). Industry Marketing.
SELECTION CRITERIA FOR A CAD/CM SYSTEM
C. J. Graham *In* CSIR Mini-Seminar on CAD/CAM Aug. 1983 9 p (For primary document see N85-24809 14-61)
Avail: NTIS HC A03/MF A01

The role of computer aided design/manufacturing (CAD/CAM in the product development process is reviewed and a CAD/CAM selection scenario is described. Criteria for system selection are identified and discussed. Highly desirable characteristics of a good CAD system include: fast response time; efficient use of computer resources; draftsman and designer oriented; integrated data base (interactively accessible by each user discipline); and general purpose applications. M.G.

N85-24811# Steffen, Robertson and Kirsten, Inc., Pretoria (South Africa).
THE USE OF A 3-D SYSTEM FOR A CIVIL ENGINEERING

PROJECT
T. R. Stacey and J. E. duPlessis *In* CSIR Mini-Seminar on CAD/CAM Aug. 1983 9 p (For primary document see N85-24809 14-61)
Avail: NTIS HC A03/MF A01

The background to the obtaining of a CAD/CAM package is outlined, giving details of the introduction to the system and the actual results. Author

N85-24812# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
RUNSTREAMS FOR USING ASKA
S. J. Duley Mar. 1984 41 p refs
(NIAST-84/27; ISBN-0-7988-3023-9) Avail: NTIS HC A03/MF A01

It is well known that the ASKA manuals, which are available in the CCS library, are not easy to read or understand immediately and therefore a considerable amount of time is needed to understand the use of the package. For this reason, two programs, which are directly interfaced to ASKA, were provided to simplify the use of ASKA. These programs, called STATAPC and DYNAPC, are geared towards large scale structural analysis, where several substructures are to be used. The steps to be followed in running a finite element problem, using the ASKA finite element package in conjunction with the STATAPC and DYNAPC programs are reviewed. A description of the simplifications made possible by the above-mentioned programs is given. The necessary procedure files needed for compilation and execution of static and dynamic problems are discussed. A description of the plotting package is also given. B.W.

N85-24813*# Research Triangle Inst., Research Triangle Park, N.C.
AN EXPERIMENT IN SOFTWARE RELIABILITY Final Report
Janet R. Dunham and John L. Pierce Mar. 1985 63 p refs
(Contract NAS1-16489)
(NASA-CR-172553; NAS 1.26:172553; Rept-412U-2094-12/14) Avail: NTIS HC A04/MF A01 CSCL 09B

The results of a software reliability experiment conducted in a controlled laboratory setting are documented. The experiment was undertaken to gather data on software failures and is one in a series of experiments being pursued by the Fault Tolerant Systems Branch of NASA - Langley Research Center, to find a means of credibly performing reliability evaluations of flight control software. The experiment tests a small sample of implementations of radar tracking software having ultra reliability requirements and uses n version programming for error detection, and repetitive run modelling for failure and fault rate estimation. The experiment results agree with those of Nagel and Skrivan in that the program error rates suggest an approximate log linear pattern and the individual faults occurred with significantly different error rates. Additional analysis of the experimental data raises new questions concerning the phenomenon of interacting faults. This phenomenon may provide one explanation for software reliability decay. M.G.

N85-24814# Defence Research Establishment, Ottawa. (Ontario).
TAPTRN: A TAPE UTILITY PROGRAM
S. Slinn Apr. 1984 59 p In ENGLISH; FRENCH summary
(AD-A150644; DREO-TN-83-38) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes two programs, TAPTRN and TSTAPE. TAPTRN is a FORTRAN callable subroutine designed to facilitate the processing of digital tapes. It contains a variety of functions which makes available all capabilities of the mag tape hardware. This subroutine is written in FORTRAN 4X and FLECS, a FORTRAN perprocessor. TSTAPE is a main program, written in FORTRAN 4X, that has been created to facilitate the usage of the TAPTRN program by providing full access to all the TAPTRN functions. Both of the programs, TAPTRN and TSTAPE are intended to be used on a HP1000 computer with a RTE IVB operating system. In this report, TAPTRN is documented under the heading: Program Overview, Calling Sequence and Parameter List, and Error Codes. The source listing for TAPTRN is found in Appendix A and the pseudo under the headings: Program Overview, and Compiling and Running the Program. The source listing for TSTAPE is found in Appendix C and the pseudo code describing the source listing in Appendix D. GRA

N85-24815# Naval Postgraduate School, Monterey, Calif.
AN ALGEBRAIC SPECIFICATION LANGUAGE AND A SYNTAX DIRECTED EDITOR M.S. Thesis
N. L. Lilly Dec. 1984 75 p
(AD-A150664; AD-E801087) Avail: NTIS HC A04/MF A01 CSCL 09/2

The rising cost of software has created a demand for methodologies which will allow the creation of portable software. Formal speculation methods have been used to increase the portability of software, permit a degree of verification and validation, and lessen the burden of maintenance. The underlying theory for most specification methods, however, make them difficult to use and frequently are not applicable to many problems. Formal specifications based on initial algebras provide a framework for precisely defining program behavior and avoid the problems of informal specification methods. This thesis presents a specification language based on initial algebras, describes an experimental syntax directed editor which uses the language's grammar. Author (GRA)

N85-24816# Naval Postgraduate School, Monterey, Calif.
SOFTWARE LIBRARY: A REUSABLE SOFTWARE ISSUE M.S. Thesis
S. G. Metcalf Jun. 1984 78 p
(AD-A150722) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis presents a conceptual view of a reusable Software Library. Issues concerning the software crisis and its subsequent impact on software development are reviewed. The traditional library is described for the purpose of comparison with the Software Library. A particular example of the Software Library, the Program Library, is described as a prototype of a reusable library. A hierarchical structure for a Program Library is discussed as an approach to making the library entities easily accessible and retrievable. The role of application generators in the Program Library is described. The special features of Ada that support programming libraries are described. Finally, noncode products in the Software Library are discussed. GRA

N85-24817# Systems Engineering for Power, Inc., Vienna, Va.
MODELING AND CONTROL OF LARGE FLEXIBLE STRUCTURES, PHASE 1 Final Report, 30 Sep. 1983 - 31 May 1984
B. Avramovic, N. Barkakati, W. Bennet, G. L. Blankenship, and H. G. Kwatny 31 Jul. 1984 188 p
(Contract F49620-83-C-0159)
(AD-A150736; SEPI-TR-84-9; AFOSR-85-0075TR) Avail: NTIS HC A09/MF A01 CSCL 12/1

The main emphasis in the first phase of this work has been the adaptation and enhancement of certain Wiener-Hopf methods for control system design used by J. Davis for treatment of linear, dynamic, distributed parameter models of flexible structures. The numerical algorithms for executing the spectral factorization were based on some earlier work of F. Stenger. The Davis-Stenger methodology was adapted to the problem of vibration control of flexible structures. The spectral factorization methodology avoids the difficult numerical problems associated with the solution of the Riccati partial differential equations which arise in the time domain approach for designing stabilizing controllers. In this way distributed phenomena, like travelling waves, which characterize the macroscopic dynamics of flexible structures are retained in the model, and their interaction with the control system is preserved in the analytical design process. Computational algorithms were developed and several prototype systems were treated including the Euler Beam and a simple two dimensional system. Second part of the research involved the use of a mathematical technique for asymptotic analysis called homogenization. Homogenization of the model for a structure with a regular infrastructure produces a model with smoothly varying effective parameters for mass density,

local tension, and damping that represents a flexible structure with a uniform homogenized internal structure. GRA

N85-24818# Washington Univ., Seattle.
UW/NW (UNIVERSITY OF WASHINGTON/NORTHWEST) VLSI CONSORTIUM Semiannual Technical Report, 27 Mar. - 22 Oct. 1984
L. Snyder 22 Oct. 1984 20 p
(Contract MDA903-82-C-0424; ARPA Order 4563)
(AD-A150740; SATR-5) Avail: NTIS HC A02/MF A01 CSCL 09/2

The goal of the UW/NW VLSI consortium is to pursue research, development and education in the use of computer aided design tools for VLSI systems with emphasis on technology transfer. The primary accomplishments for the period Mar. 26 - Oct. 22 1984 were: CMOS Release; New DRC. In an effort to improve the performance of VLSI design rule checkers (DRC), the consortium began a comparative analysis between the algorithms used in the Carnegie-Mellon DRC and a new algorithm developed at the University of Washington. The experiments used a variety of chips including the RISC II and PSC (programmable systolic chip). The results showed that the new approach gives improved performance and the consortium will add this new DRC to future releases; and chip designs. GRA

N85-24819# Maryland Univ., College Park. Dept. of Computer Science.
FUNCTIONAL ANALYSIS OF PROGRAMS
R. Hamlet and H. Mills Oct. 1984 40 p Prepared in cooperation with Oregon Graduate Center, Beaverton, OR
(Contract F49620-83-K-0018)
(AD-A150742; CS/E-84-006; AFOSR-85-0054TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

Analysis of computer programs using a semantics that combines features of the operational and denotational methods is described. The method is an explanatory, analytic tool, a program calculus that allows program meaning to be obtained from program syntax, then compared to a desired meaning by a simple set-theoretic methods. Meanings are functional, sets of ordered (input, output) pairs. A subset of PASCAL is used to illustrate the theory. (Author). GRA

N85-24820# Illinois Univ., Urbana. Urbana Engineering-psychology Research Lab.
THE INTEGRATION OF INFORMATION FROM AN ANALOG-VISUAL DISPLAY: THE ROLE OF DIMENSIONAL INTEGRALITY
C. M. Carswell and C. D. Wickens Dec. 1984 35 p
(Contract N00014-79-C-0658)
(AD-A150756; EPL-84-4/ONR-84-3) Avail: NTIS HC A03/MF A01 CSCL 09/2

The integration of information from several sources often proves to be an overwhelming task for the human decision-maker. It is proposed, however, that in such an information-integration task, the demand on the human's limited information processing resources will be lessened to the extent that the relevant information is displayed in proximity. In this report, proximity is defined by the degree to which the analog-visual dimensions representing the information are integral. Twenty-four subjects each monitored two dynamic systems over the course of three 2-hr sessions. Each system consisted of a single output, the value of which was determined jointly by two inputs. Two analog-visual displays, a bar graph and a triangular object display, were used to present the system input/output information to subjects. Use of the triangular display resulted in more rapid detection of system failures at three levels of task difficulty. Author (GRA)

N85-24821# Naval Postgraduate School, Monterey, Calif.
DIGITAL COMPUTER APPLICATIONS OF KALMAN FILTER IN TARGET TRACKING M.S. Thesis
V. I. Martzoucos Jun. 1984 193 p
(AD-A150770) Avail: NTIS HC A09/MF A01 CSCL 09/2

This paper analyzes the problem of tracking targets in noisy conditions. First a basic background is provided. That includes general concepts from estimation theory and a specific description of the Kalman filter and its use for treating the various aspects of the target tracking problem. Then progressively more difficult situations of target tracking examples are simulated and the results are analyzed and compared with the literature. GRA

N85-24822# Naval Postgraduate School, Monterey, Calif.
THE ENHANCEMENT OF CONCURRENT PROCESSING THROUGH FUNCTIONAL PROGRAMMING LANGUAGES M.S. Thesis
T. R. McGrath Jun. 1984 75 p
(AD-A150771) Avail: NTIS HC A04/MF A01 CSCL 09/2

The von Neumann bottleneck imposes severe limitations on programming languages. This thesis points out that although the hardware limitations imposed by this bottleneck are being overcome, its constraints will remain in programs as long as there are assignments statements in their code. We assert that functional programming languages allow us to harness the processing power of computers with hundreds or even thousands of processors, and which allow us to solve problems which are time/cost prohibitive on a uniprocessor. We discuss a mechanical method for transforming imperative programs into functional programs. We feel that the mechanical transformation process is very inexpensive, and that it might be the best way to make imperative library programs into functional ones which are well suited to concurrent processing. GRA

N85-24823# Naval Postgraduate School, Monterey, Calif.
INTEGRATION OF AN APPLE 2 PLUS COMPUTER INTO AN EXISTING DUAL AXIS SUN TRACKER SYSTEM M.S. Thesis
R. J. Morais Jun. 1984 103 p
(AD-A150778) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis describes the integration of an Apple II Plus computer into an existing Sun tracking system. The Apple Computer replaced an Intel 80/10A single board computer as the system controller. Software development and hardwiring were necessary to successfully integrate the new computer into the system. With the new computer installed, user interaction with the tracking system became possible. Additionally, it was possible to replace hard-to-interpret assembly language code with higher level BASIC code as the system controlling software. GRA

N85-24824# Naval Postgraduate School, Monterey, Calif.
EASYPLOT: AN INTERACTIVE, USER-FRIENDLY GRAPHICS PROGRAM M.S. Thesis
J. C. Mainwaring Sep. 1984 180 p
(AD-A150779) Avail: NTIS HC A09/MF A01 CSCL 09/2

This thesis is an interactive Fortran program called Easyplot which allows a person to quickly access the NPS IBM 3033 graphics capabilities to produce a professional graph. No programming is required on the part of the user. Easyplot systematically asks the user questions, the responses to which are utilized by the Disspla software system to output two and three dimensional graphs. This program is available to any Naval Postgraduate School computer user. GRA

N85-24825# Washington Univ., St. Louis, Mo. School of Engineering and Applied Science.
IMPLEMENTATION OF A C1 TRIANGULAR ELEMENT BASED ON THE P-VERSION OF THE FINITE ELEMENT METHOD
D. W. Wang, I. N. Katz, and B. A. Szabo 1984 13 p
(Grant AF-AFOSR-0252-81)
(AD-A150904; AFOSR-85-0113TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The implementation of a computer code CONE (for C(1) continuity) based on the p-version of the finite element method is described. A hierarchic family of triangular finite elements of degree $p > \text{or} = 5$ is used. This family enforces C(1) continuity across inter-element boundaries, and the code is applicable to fourth order partial differential equations in two independent variables, in particular to the biharmonic equation. Applications to several benchmark problems in plate bending are presented. Sample

results are examined and compared both with theoretical predictions and with the computations of other programs. Significant improvements are shown for the results obtained using CONE. GRA

N85-24826# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
NONLINEAR 0-1 PROGRAMMING. 1: LINEARIZATION TECHNIQUES, REVISION
E. Balas and J. P. Mazzola Feb. 1983 34 p
(Contract N00014-75-C-0621; Grant NSF ECS-79-02506)
(AD-A150960; MSRR-467(R)A; WP-20-80-81-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

Any real-valued nonlinear function in 0-1 variables can be rewritten as a multilinear function. We discuss classes of lower and upper bounding linear expressions for multilinear functions in 0-1 variables. For any multilinear inequality in 0-1 variables, we define an equivalent family of linear inequalities. This family contains the well known system of generalized covering inequalities, as well as other linear equivalents of the multilinear inequality that are more compact, i.e., of smaller cardinality. In a companion paper, we discuss dominance relations between various linear equivalents of a multilinear inequality, and describe a class of algorithms for multilinear 0-1 programming based on these results. Author (GRA)

N85-24827# Rochester Univ., N. Y. Dept. of Computer Science.
THE HORNE REASONING SYSTEM, REVISION
J. F. Allen, M. Giuliano, and A. M. Frisch Sep. 1984 61 p
(Contracts N00014-80-C-0197; N00014-82-K-0193; Grant NSF IST-82-10564)
(AD-A150983; TR-126-REV) Avail: NTIS HC A04/MF A01 CSCL 09/2

HORNE is a programming system that offers a set of tools for building automated reasoning systems. It offers three major modes of inference; (1) a horn clause theorem prover (backwards chaining mechanism); (2) a forward chaining mechanism; and (3) a mechanism for restricting the range of variables with arbitrary predicates. All three modes use a common representation of facts, namely horn clauses with universally quantified variables, and use the unification algorithm. Also they all share the following additional specialized reasoning capabilities: (1) variables may be typed with a fairly general type theory that allows intersecting types; (2) full reasoning about equality between ground terms, and limited equality reasoning for quantified terms; and (3) escapes into LISP for use as necessary. This paper contains an introduction to each of these facilities, and the HORNE User's Manual. GRA

N85-24828# Rochester Univ., N. Y. Dept. of Computer Science.
USING COLOR TO SEPARATE REFLECTION COMPONENTS
S. A. Shafer 2 Apr. 1984 30 p
(Contract N00014-82-K-0193)
(AD-A150999; TR-136) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper presents an algorithm for analyzing a standard color image to determine intrinsic images of the amount of interface (specular) and body (diffuse) reflection at each pixel. The interface reflection represents the highlights from the original image, and the body reflection represents the original image with highlights removed. Such intrinsic images are of interest because the geometric properties of each type of reflection are simpler than the geometric properties of intensity in a black-and-white image. The algorithm is based upon a physical model of reflection which states that two distinct types of reflection - interface and body reflection - occur, and that each type can be decomposed into a relative spectral distribution and a geometric scale factor. This model is far more general than typical models used in computer vision and computer graphics, and includes most such models as special cases. In addition, the model does not assume a point light source or uniform illumination distribution over the scene. The properties of spectral projection into color space are used to derive a new model of pixel-value color distribution, and this model is exploited in an algorithm to derive the intrinsic images. Suggestions are provided for extending the model to deal with diffuse illumination and for analyzing the intrinsic images of reflection. GRA

N85-24829# Stanford Univ., Calif. Systems Optimization Lab.
SOFTWARE AND ITS RELATIONSHIP TO METHODS
Philip E. Gill, Walter Murray, Michael A. Saunders, and Margaret H. Wright Nov. 1984 18 p refs Presented at SIAM Conf. on Numerical Optimization, Boulder, Col., 12 June 1984
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; DAAG29-84-K-0516; Grants NSF MCS-79-26009; NSF ECS-83-12142)
(DE85-004784; SU-SOL-84-10; CONF-8406233-1) Avail: NTIS HC A02/MF A01

It is assumed that numerical software is simply a computer implementation of a known method. Implicit in this view is the assumption that the flow of information is in one direction only. However, developments in methods and software are intimately related, and neither is complete if considered in isolation. Ways in which the development of numerical software has influenced the research in optimization methods are illustrated. DOE

N85-24830# Oak Ridge National Lab., Tenn.
CHIL: A COMPREHENSIVE HISTOGRAMMING LANGUAGE
W. T. Milner and J. A. Biggerstaff 1984 5 p refs Presented at Nuclear Sci. Symp., Orlando, Fla., 31 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005356; CONF-841007-48) Avail: NTIS HC A02/MF A01

A high level language, CHIL, has been developed for use in processing event-by-event experimental data at the Holifield Heavy Ion Research Facility (HHIRF) using PERKIN-ELMER 3230 computers. CHIL has been fully integrated into all software which supports on-line and off-line histogramming and off-line preprocessing. CHIL supports simple gates, free-form-gates (2-D regions of arbitrary) shape), condition test and branch statements, bit-tests, loops, calls to up to three user supplied subroutines and histogram generating statements. Any combination of 1, 2, 3 or 4-D histograms (32 megachannels max) may be recorded at 16 or 32 bits/channel. User routines may intercept the data being processed and modify it as desired. The CPU-intensive part of the processing utilizes microcoded routines which enhance performed by about a factor of two. DOE

N85-24831# Sandia Labs., Albuquerque, N. Mex.
VIDEO ANIMATION SYSTEM
John Mareda 1985 18 p Presented at the ISSCO Conf., San Diego, Calif., 25 Feb. 1985
(Contract DE-AC04-76DP-00789)
(DE85-005494; SAND-85-0033C; CONF-850257-1) Avail: NTIS HC A02/MF A01

A video animation system is being used at Sandia Laboratories in Albuquerque to record computer generated images directly onto 3/4" videocassettes. The system serves as a quick turn around process for previewing sequences prior to sending them to a Dicomed film recorder. It is also used when videocassette is appropriate for final output. The video animation system in place at Sandia is described. The system consists of a medium resolution graphics display system, a 3/4" professional quality videocassette recorder, and a controller that allows single frame recording of computer generated images to be performed under program control. Examples of output produced using this system are presented which will include animated sequences of scientific data produced by DISSPLA programs. DOE

N85-24832# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
EDIPAS: A MULTIDISCIPLINE AND INTEGRATED FACILITY FOR MANAGEMENT AND EVALUATION OF ENGINEERING DATA
F. J. Heerema and H. A. Kreijkamp 26 Oct. 1983 17 p refs Presented at 6th Intern. Conf. and Exhibition on Computers in

Design Eng., CAD84, Brighton, England, 3-5 Apr. 1984
(NLR-MP-83062-U) Avail: NTIS HC A02/MF A01

The EDIPAS multidiscipline integrated facility for management, analysis, and presentation of engineering data is described. The data management facilities serve the creation of networks of computer programs involved in the design cycle. The analysis and presentation facilities provide general means to evaluate information in a database, containing data of various sources, in a common and easy to understand representation. The executive facility can be used for routine operations with the analysis and presentation part, interactively and in batch. Author (ESA)

N85-24833# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
DATAFLOW COMPUTATION
A. P. W. Boehm 1983 218 p refs
(CWI-TRACT-6; B8471224; ISBN-90-6194-272-2) Avail: NTIS HC A10/MF A01

Dynamic Network of Processes (DNP) language for parallel programming on dataflow machines is studied. The topology of the dataflow net, to the amount and the values of the problem data is reported by DNP. Semantic and complexity measures of DNP are discussed. Programs for NP-complete problems are given. Author (ESA)

N85-24834# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
SELECTION CRITERIA AND COMPUTER AIDED DESIGN (CAD) SYSTEMS
R. P. deMoel 11 Apr. 1984 18 p refs In DUTCH; ENGLISH summary Presented at CIAD Theme Meeting Selection Criteria, 12 Apr. 1984
(NLR-MP-84037-U; B8478514) Avail: NTIS HC A02/MF A01

A step-by-step execution of the selection process of computer aided design systems is presented. Based on critical requirements, the feasibility study results in a strategy. The predesign stage considers the technical solutions tuned to the principal requirements and gives a preference and/or a priority. Author (ESA)

N85-23842*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EIGENSYSTEM REALIZATION ALGORITHM FOR APPLICATION TO MODAL TESTING
Jer-Nan Juang *In its* Large Space Antenna Systems Technol., 1984, Pt. 2 Apr. 1985 p 483-502 refs (For primary document see N85-23840 14-15)
Avail: NTIS HC A21/MF A01 CSCL 09B

N85-24799# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF CONVEYOR PROCESSING OF VECTOR COMMANDS IN MULTIPROCESSOR COMPUTER SYSTEMS WITH A REORGANIZABLE STRUCTURE
A. A. Zabolotnyy, V. M. Kostelyanskiy, G. M. Lekhnova, and D. A. Nedzelskiy *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 32-42 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 16-21 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

N85-24801# Joint Publications Research Service, Arlington, Va.
GRAFIT LANGUAGE FOR SIMULATING TWO-DIMENSIONAL GEOMETRIC ENTITIES AND SKETCHES
V. G. Sirotin *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 62-67 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 79-80 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

N85-24802# Joint Publications Research Service, Arlington, Va.
AUTOMATION OF DEVELOPMENT OF SOFTWARE FOR SWITCHING UNITS THAT ARE IMPLEMENTED IN THE FORM OF MULTIPROCESSOR SYSTEMS ON A MICROCOMPUTER BASE
G. R. Ovchinnikov, Yu. D. Yurakov, and A. G. Dmitriyev *In its* USSR Rept.: Cybernetics, Computers, and Automation Technol. (JPRS-UCC-85-002) 4 Mar. 1985 p 68-77 refs Transl. into ENGLISH from Upr. Sistemy i Mashiny (Kiev), no. 5, Sep. - Oct. 1984 p 41-44; 125 (For primary document see N85-24794 14-60)
Avail: NTIS HC A05

N85-24187# Joint Publications Research Service, Arlington, Va.
FRENCH WORK TOWARD FLEXIBLE SOFTWARE WORKSHOPS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-013) 26 Apr. 1985 p 55-61 refs Transl. into ENGLISH from Le Nouvel Automatiseme (Paris), Oct. 1984 p 22-25 (For primary document see N85-24183 14-31)
Avail: NTIS HC A06/MF A01

N85-24193# Joint Publications Research Service, Arlington, Va.
RESEARCH ON CAD/CAM SUPPORT FOR MICROPROCESSOR DEVELOPMENT SURVEYED
Wlodzimierz Soinski *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 42-53 refs Transl. into ENGLISH from Przeglad Morski (Gydnia), no. 12, Dec. 1984 p 58-66 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

N85-24760 Centre National d'Etudes Spatiales, Toulouse (France).
PROPAGATION OF NUMERICAL ERRORS IN COMPUTERS AND NUMERICAL QUALITY [PROPAGATION DES ERREURS NUMERIQUES DANS LES CALCULATEURS ET QUALITE NUMERIQUE]
C. Soubry *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 179-191 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24769 Centre National d'Etudes Spatiales, Toulouse (France).
SPACEBORNE AUTOMATIC DATA PROCESSING [AUTOMATIQUE SPATIALE]
M. Maurette *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 613-619 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

62 COMPUTER SYSTEMS

Includes computer networks.

N85-24835*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
EXECUTIVE CONTROL SYSTEMS IN THE ENGINEERING DESIGN ENVIRONMENT M.S. Thesis
Patricia W. Hurst May 1985 107 p refs
(Grant NAG1-242)
(NASA-CR-172582; NAS 1.26:172582) Avail: NTIS HC A06/MF A01 CSCL 09B

An executive control system (ECS) is a software structure for unifying various applications codes into a comprehensive system. It provides a library of applications, a uniform access method through a cental user interface, and a data management facility. A survey of twenty-four executive control systems designed to unify various CAD/CAE applications for use in diverse engineering design environments within government and industry was conducted. The goals of this research were to establish system requirements to survey state-of-the-art architectural design approaches, and to provide an overview of the historical evolution of these systems. Foundations for design are presented and include environmental settings, system requirements, major architectural components, and a system classification scheme based on knowledge of the supported engineering domain(s). An overview of the design approaches used in developing the major architectural components of an ECS is presented with examples

taken from the surveyed systems. Attention is drawn to four major areas of ECS development: interdisciplinary usage; standardization; knowledge utilization; and computer science technology transfer.
M.G.

N85-24836# California Univ., Livermore. Lawrence Livermore Lab.
LINCS
J. G. Fletcher 15 Oct. 1984 4 p refs Presented at 14th Cray User Group Meeting, San Francisco, 1 Oct. 1984
(Contract W-7405-eng-48)
(DE85-006151; UCRL-91653; CONF-8410219-2) Avail: NTIS HC A02/MF A01

LINCS - the Livermore Interactive Network communications Structure (or Standard or System) - is a hierarchy of communication protocols designed at the Lawrence Livermore National Laboratory and used by the Laboratory's Octopus computing network and the extension of that network called Labnet. Since meaningful communication requires some degree of commonality between the sender's and the receiver's view of their environment, LINCS defines salient features of that view. The view conforms to an underlying philosophy about the nature of computing and computer-oriented communication, aspects of which are discussed here.
DOE

N85-24837# Idaho National Engineering Lab., Idaho Falls.
COMPUTER VISUAL SYSTEM (CVS) REFERENCE MANUAL
D. M. Snider and K. I. Wagner Jan. 1985 161 p
(Contract DE-AC07-76ID-01570)
(DE85-006328; EGG-IS-6478-Rev-1) Avail: NTIS HC A08/MF A01

A reference manual for the Idaho National Engineering Laboratory (INEL) Computer Visual System (CVS) is presented. The manual contains a summary of the operation of the CVS program and describes the hardware requirements. It explains the main features and operation of the program as well as how to communicate with the host computer. The CVS is a high performance color graphics system. This system enables color pictures to be generated and edited on a color raster terminal and subsequently output as 35mm color transparencies and gray-scale or black and white hard copies. It provides processors for the construction of word slides, tables, charts, and sketches. Commands for the creation and editing of images are entered by picking items from menus displayed on the terminal screen. The CVS program executes on a Control Data Corporation (CDC) CYBER 176 computer under the NOS operating system. The user interacts with CVS through a terminal, entering commands from a keyboard and tablet.
DOE

N85-24770 Centre National d'Etudes Spatiales, Toulouse (France).
THE COMPUTING FACILITIES OF THE TOULOUSE SPACE CENTER [LES MOYENS INFORMATIQUES DU CST]
A. Dargent *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 621-639 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-24838# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SOME CRITICAL FACTORS THAT LIMIT THE EFFECTIVENESS OF MACHINE INTELLIGENCE TECHNOLOGY IN MILITARY SYSTEMS APPLICATIONS
S. D. Harris and J. M. Owens Sep. 1984 24 p
(WR0-4210)
(AD-A150684; NAMRL-SR-84-2) Avail: NTIS HC A02/MF A01 CSCL 06/4

Machine intelligence technology is not the product of a recent breakthrough in computer system design as many have been led to believe. The fundamental concepts, and many of the underlying problems in the design of today's intelligent machines, were recognized fifty years ago, and earlier. Research efforts in diverse areas, some spanning decades, have culminated in the current state of the technology. However, numerous and often perplexing methodological problems currently challenge system development and thwart the widespread and successful application of the technology in critical areas. The issues discussed in this paper arise from the failure of MI technology to confront and effectively solve many of the complex problems inherent in military systems applications. Most critical is the fact that performance criteria for intelligent machines are vague and inadequate, or completely unspecified in some instances. It is often impossible to ascertain from the reported data exactly what a system is supposed to do and how well its functions are performed. The problem of performance assessment is one of several difficult issues discussed in this report.
GRA

N85-24839# Boeing Aerospace Co., Seattle, Wash. Engineering Technology Organization.
ARTIFICIAL INTELLIGENCE APPLICATIONS TO TESTABILITY Final Report, Apr. 1983 - May 1984
H. Lahore Griffiss AFB, N.Y. RADC Oct. 1984 187 p
(Contract F30602-83-C-0048)
(AD-A150694; RADC-TR-84-203) Avail: NTIS HC A09/MF A01 CSCL 14/2

This study provides the foundation for a logical and cost-effective program for applying artificial intelligence to electronic testability for the military. Emphasis is on those artificial intelligence (AI) techniques capable of practical application with low risk development within three to five years. The primary near term applications are design support and maintenance applications. Eight potential applications are developed and evaluated: (1) computer aided preliminary design for testability, (2) Smart Built-in Test, (3) Smart System Integrated Test, (4) Box Level Maintenance Expert, (5) System Level Maintenance Expert, (6) Smart Maintenance Expert, (7) Automatic Test Program Generation, and (8) Smart Bench Tester. All of these application opportunities can be implemented with engineering workstations which are becoming available directly to designers.
GRA

N85-24840# Rochester Univ., N. Y. Dept. of Computer Science.
SEMANTIC NETWORKS AND NEURAL NETS
L. Shastri and J. A. Feldman Jun. 1984 104 p
(Contract N00014-82-K-0193; Grant NSF IST-82-08571)
(AD-A150750; TR-131) Avail: NTIS HC A06/MF A01 CSCL 09/4

Connected networks of nodes representing conceptual knowledge are widely employed in artificial intelligence and cognitive science. This report describes a direct way of realizing these semantic networks with neuron-like computing units. The proposed framework appears to offer several advantages over previous work. It obviates the need for a centralized knowledge base interpreter, thereby partially solving the problem of computational effectiveness and also embodies an evidential semantics for knowledge that provides a natural treatment of defaults, exceptions and inconsistent or conflicting information. The model employs a class of inference that may be characterized as working with a set of competing hypotheses, gathering evidence for each hypothesis and selecting the best among these. The resulting system has been simulated and is capable of supporting existing semantic network applications dealing with problems of recognition and recall in a uniform manner.
GRA

N85-24841# Brown Univ., Providence, R. I. Div. of Engineering.
PRACTICAL METHODS FOR THE COMPENSATION AND CONTROL OF MULTIVARIABLE SYSTEMS Final Report, 15 Sep. 1983 - 14 Sep. 1984
W. A. Wolovich and C. Cometta Jan. 1985 8 p
(Grant AF-AFOSR-0359-83)

(AD-A151047; AFOSR-85-0106TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period covered by the grant four papers were written. Titles include, Parameterization issues in multivariable adaptive control, A computational technique for inverse kinematics, and Deadbeat control using periodic feedback. A unified treatment of direct and indirect strategies for parameterizing multivariable adaptive controllers was given. By considering unknown, but linear and time invariant systems in a deterministic setting, virtually all commonly employed adaptive control strategies were derived using pole placement notions. A new numerical solution to the general version of the inverse kinematic problem in robotics was obtained. Research within the Laboratory for Engineering Man/Machine Systems at Brown University focussed on the development of a general purpose 68000 based microprocessor controller which could be employed in a variety of control environments. At present, a preliminary version of such a unit has been constructed and is being used to control a single axis of an IBM RS11 Cartesian robot. Author (GRA)

N85-24842# Gordon Research Conferences, Inc., Kingston, R.I.
GORDON CONFERENCE ON FUNDAMENTALS OF CYBERNETICS Final Report, 1 Aug. - 31 Oct. 1984
L. Steg 31 Oct. 1984 12 p
(Contract N00014-84-G-0128; DA Proj. RR0-4209)
(AD-A151074) Avail: NTIS HC A02/MF A01 CSCL 06/4

A conference was organized that brought together 110 research scientists of diverse specialities to address a comprehensive review of the relationship of cybernetics to relevant disciplines, including biochemistry, physiology, chemistry and information sciences, and to relevant conceptual areas, including interactive training, organizational autonomy and policy methodology. Author (GRA)

N85-24755 Centre National d'Etudes Spatiales, Toulouse (France).
OPTIMAL CONTROL AND OPTIMIZATION [CONTROLE OPTIMAL ET OPTIMISATION]
J. Noailles *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 65-76 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-24843# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CONSTRAINED PARABOLIC APPROXIMATION OF CURVES IN THE FINITE ELEMENT METHOD
M. L. Baart and R. J. Y. McLeod (New Mexico State Univ., Las Cruces) Dec. 1983 22 p refs Submitted for publication
(CSIR-TWISK-340) Avail: NTIS HC A02/MF A01

In the construction of plane finite elements, curved boundary segments may be approximated by parabolic arcs that pass through the end points of each segment. The two remaining free parameters of the parabola may then be used to optimize the fit while satisfying constraints arising from the intended use of the approximating curve in the finite element method. A geometrical measure of the discrepancy between a given curve and a parabola is introduced. This notion leads to an optimization problem in two variables that can be solved quickly and reliably by a simple method that takes advantage of the special structure of the problem. M.G.

N85-24844# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON AN ASSYMETRIC CHOICE FOR A CLUSTER EXPANSION OF THE THREE-BODY PROBLEM
D. Eyre Nov. 1983 14 p refs Submitted for publication
(CSIR-TWISK-339) Avail: NTIS HC A02/MF A01

A cluster expansion of the three body problem is constructed from an asymmetric choice of the Alt-Grassberger-Sandhas operator equations. The Karlsson-Zeiger approach is shown to lead to one choice of the effective interaction. In a model three-boson problem it is found that no numerical advantage is gained by solving the cluster expansion corresponding to the Karlsson-Zeiger choice of operators. M.G.

N85-24845# North Carolina Univ., Chapel Hill. Operations Research and Systems Analysis.
THE COMPLEXITY OF RELIABILITY COMPUTATIONS IN PLANAR AND ACYCLIC GRAPHS
J. S. Provan Dec. 1984 27 p
(Grant AF-AFOSR-0140-84)
(AD-A150759; UNC/ORSA/TR-83/12; AFOSR-85-0095TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The author shows that the problem of computing source-sink reliability is NP-hard, in fact P-complete, even for undirected and acyclic directed source-sink planar graphs having vertex degree at most three. Thus the source-sink reliability problem is unlikely to have an efficient algorithm, even when the graph can be laid out on a rectilinear grid. GRA

N85-24846# Stanford Univ., Calif. Lab. for Computational Statistics.
BETTER BOOTSTRAP CONFIDENCE INTERVALS
B. Efron Nov. 1984 48 p
(Contracts N00014-83-K-0472; DAAG29-82-K-0056; Grants NSF MCS-80-24649; N00014-83-G-0121)
(AD-A150798; LCS-TR-14) Avail: NTIS HC A03/MF A01 CSCL 12/1

We consider the problem of setting approximate confidence intervals for a single parameter theta in a multiparameter family. The standard approximate intervals based on maximum likelihood theory, can be quite misleading so, in practice, tricks based on transformations, bias, corrections, etc., are often used to improve their accuracy. The bootstrap confidence intervals discussed in this paper automatically incorporate such tricks without requiring the statistician to think them through for each new application, at the price of a considerable increase in computational effort. In addition to parametric families, bootstrap intervals are also developed for nonparametric situations. GRA

N85-24847# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
ATTAINABLE RATES OF CONVERGENCE OF MAXIMA
H. Rootzen Aug. 1984 4 p
(Contract F49620-82-C-0009)
(AD-A150838; AFOSR-85-0142TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Any exponential rate of convergence can be obtained for maxima of i.i.d. random variables, while faster than exponential convergence implies that the variables have extreme value distribution. Author (GRA)

N85-24848# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
THE GENERATION OF THREE-DIMENSIONAL BODY-FITTED COORDINATE SYSTEMS FOR VISCOUS FLOW PROBLEMS Final Report, 1 Oct. 1983 - 30 Sep. 1984
Z. U. A. Warsi Oct. 1984 63 p
(Grant AF-AFOSR-0185-80)
(AD-A150861; AFOSR-85-0146TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The problem of numerical generation in surfaces and in three-dimensional configurations through elliptic Partial Differential Equations has been pursued under this grant. The developed mathematical model has been programed on CRAY-1 and has been tested for single and two-body configurations enclosed in a single boundary and for generation of coordinates in a single surface. The main aim of this research has been to develop and implement a technique for the generation of spatial coordinates in 3D regions enclosed by arbitrary smooth surfaces for ulimate use in the numerical solution of the Navier-Strokes equations. In this

regard, a mathematical model based on a set of elliptic PDE's has been developed, which has been used to generate smooth coordinates in the region formed by arbitrary inner and outer surfaces of known shapes, around multibodies, particularly around a wing-body combination. These equations have also been used to generate surface coordinates in arbitrary surfaces and are also capable of coordinate redistribution in any desired manner both in 3D regions and in 2D surface regions. GRA

N85-24849# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A SIMPLE AND EFFICIENT ALGORITHM TO COMPUTE TAIL PROBABILITIES FROM TRANSFORMS
L. K. Platzman, J. C. Ammons, and J. J. Bartholdi, III Jan. 1985 23 p
(Contract N00014-80-K-0709; Grant NSF ECS-83-51313)
(AD-A150928) Avail: NTIS HC A02/MF A01 CSCL 12/1

We present an algorithm to compute the tail probability that a random variable exceeds a specified number, given only an expression for its transform. Our method consists essentially of summing a power series, so it is easy to perform and requires little memory. Furthermore, any desired degree of accuracy may be specified in advance of the computation, after which the computational effort is nearly linear in the reciprocal of the prespecified error. We also show that the problem is NP-hard, suggesting that there exists no procedure significantly better than ours. Author (GRA)

N85-24850# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
HIGH TIME-RESOLUTION STUDIES OF THE AURORAL IONOSPHERE Final Report, 1 Feb. 1982 - 31 May 1984
J. C. Foster 1 Sep. 1984 9 p
(Grant AF-AFOSR-0093-82)
(AD-A150945; AFOSR-85-0149TR) Avail: NTIS HC A02/MF A01 CSCL 04/1

Monostatic radar experimental technique and analysis software were developed to permit spatial mapping of high-latitude ionospheric parameters across a 1000 km region. Details of the midnight and noon sectors were examined. MITHRAS electric field analysis supported the development of predictive ionospheric models and addressed global imaging of the convection electric field. GRA

N85-24851# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
ON MATCHINGS AND HAMILTONIAN CYCLES IN RANDOM GRAPHS Management Sciences Research Report
B. Bollobas and A. M. Frieze Dec. 1983 36 p
(Contract N00014-75-C-0621)
(AD-A151015; MSRR-512) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document describes matchings and Hamiltonian cycles in random graphs. It is also shown that if a random graph G with vertices (1,2,...,n) is constructed by randomly adding edges one at a time then, almost surely, as soon as G has degree k, G has (k/2) disjoint hamiltonian cycles plus a disjoint perfect matching if k is odd, where k is a fixed positive integer. GRA

N85-24852# Virginia Univ., Charlottesville. Dept. of Systems Engineering.
THE OMNI-TRANSFORM IN SINGLE-CHANNEL QUEUES
M. Krakowski Feb. 1985 19 p
(Contract N00014-83-K-0624)
(AD-A151019; UVA/525393/SE85/106) Avail: NTIS HC A02/MF A01 CSCL 12/1

The method of omni-equations along with the conservation method is well-suited to the treatment of the process unfinished work, or backlog for terseness, in the model M/G/1. Since some partial results have also been obtained for the more general model G/G/1 we shall start with G/g/1 under steady-state conditions. Throughout this paper linear omni-equations will be subject to the omni-convention, i.e., it will be understood that the expectation is taken of each side of the omni-equation with respect to each random variable. An analogy was pointed out between the process waiting time in M/G/1 and the process toss a coin till heads show up where the tossing time is a random variable. The omni-calculus also sheds some light on the model G/G/1. GRA

N85-24853# North Carolina Univ., Chapel Hill. Operations Research and Systems Analysis.
PROPERTIES OF SYSTEMS WHICH LEAD TO EFFICIENT COMPUTATION OF RELIABILITY
M. O. Ball and J. S. Provan Aug. 1984 9 p
(Grant AF-AFOSR-0140-84)
(AD-A151033; UNC/ORSA/TR-84/16; AFOSR-85-0105TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

One of the most widely used approaches to computing systems reliability is to represent the system structure in terms of a Boolean sum of all minpaths. This expression is then transformed into a sum of disjoint terms. The probability of each term is then summed to obtain the reliability of the system. A key question with respect to the difficulty of this process relates to the ability to transform the initial sum into a sum of disjoint products. In this paper, the authors show that for the class of shellable systems, there always exists a disjoint product expression with a number of terms equal to the number of minpaths. The authors provide several examples of shellable systems for which an expression can be efficiently found. GRA

N85-24854# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
ERGODICITY AND STEADY-STATE-EQUILIBRIUM CONDITIONS FOR MARKOV CHAINS
L. Georgiadis and P. Papantoni-Kazakos Jan. 1985 19 p
(Grant AF-AFOSR-0229-83)
(AD-A151038; UCT/DEECS/TR-85-1; AFOSR-85-0108TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Generalized stationary Markov chains with denumberable state space are considered. For irreducible and aperiodic such chains, some sufficient conditions for ergodicity and steady state equilibrium are developed. The conditions for ergodicity are generalizations of previously proposed such conditions, and they are more tractable for certain applications. Author (GRA)

N85-24855# Argonne National Lab., Ill.
SYNTHETIC ACCELERATION OF COARSE-MESH S/SUB n/ TRANSPORT CALCULATIONS
H. Khalil 1984 5 p refs Presented at the Joint Meeting of the American Nuclear Society and the Atomic Industrial Forum, Washington, D.C., 11 Nov. 1984
(Contract W-31-109-eng-38)
(DE84-014721; CONF-841105-20) Avail: NTIS HC A02/MF A01

The lack of an effective method for accelerating the iterative evaluation of the scattering term has, to date, limited the usefulness of multidimensional nodal S/sub n/ schemes. Although the diffusion-synthetic method is potentially one of the most efficient acceleration techniques, the instability of this method for large mesh widths (when the diffusion equation is conventionally differenced) makes it necessary to apply specially-designed differencing techniques to the solution of the diffusion equation. A stable diffusion scheme for synthetic acceleration of nodal s/sub n/ calculations in multidimensional Cartesian geometries is developed. DOE

N85-24856# Argonne National Lab., Ill. Mathematics and Computer Science Div.
MODIFICATION OF THE WEEK'S METHOD FOR NUMERICAL INVERSION OF THE LAPLACE TRANSFORM
J. N. Lyness and G. Giunta (Naples Univ.) Oct. 1984 24 p refs
(Contract W-31-109-eng-38)
(DE85-006576; ANL/MCS-TM-35) Avail: NTIS HC A02/MF A01

The Week's method for calculating numerical values of f(t) from its Laplace transform F(s) involves the numerical evaluation of a set of contour integrals. A powerful modification is described, the use of which gives results of comparable accuracy using almost

precisely half the number of complex function values. This and other possible minor modifications are discussed. DOE

N85-24857# Argonne National Lab., Ill. Div. of Mathematics and Computer Science.
MAINTAINING SOLUATION INVARIANTS IN THE NUMERICAL SOLUTION OF ODEs
C. W. Gewar Nov. 1984 14 p refs
(Contract W-31-109-eng-38)
(DE85-005918; ANL/MCS-TM-40) Avail: NTIS HC A02/MF A01

Techniques for maintaining the numerical consistency of equality and inequality invariants known to be obeyed by the true solutions of ordinary differential equations (ODEs) are discussed. Shampine has examined the problem and made some recommendations for one-step methods. A general framework is used to justify a particular form of his technique for both one-step and multistep methods in he case of equality invariants. This framework can also be used for inequality invariants, but is not satisfactory for multistep methods. However, in a large class of inequality invariants, typified by those arising in chemical kinetic problems, it is shown that the invariant can be satisfied automatically by the numerical method. DOE

N85-24858# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
SURFACES WITH CANONICAL HYPERPLANE SECTIONS Thesis
D. H. J. Epema 1984 122 p refs
(CWI-TRACT-1; B8424022; ISBN-90-6196-267-6) Avail: NTIS HC A06/MF A01

Projective algebraic surfaces with canonical hyperplane sections are studied. There are uniquely four classes of those surfaces and their canonical class is contained in the nonrational singularites. An explicit procedure to construct all (generic) rational surfaces with canonical hyperplane sections in a fixed g-dimensional projective space is given. Mixed Hodge structures on the cohomology groups of an open part, complementary of exceptional divisors, are studied. Author (ESA)

N85-24859# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ALGORITHMS AND APPROXIMATIONS FOR QUEUEING SYSTEMS
M. H. vanHoorn 1984 130 p refs
(CWI-TRACT-8; B8441039; ISBN-90-6196-274-9) Avail: NTIS HC A07/MF A01

Basic models from queueing theory are discussed and computational algorithms are developed. A wide class of queueing recursive computational schemes for the state probability and other performance measures are given. The regenerative method of Hordijk-Tijms and the regenerative method of Federgruen-Tijms are used in the analysis. This method is preferred to the classical algorithms. Author (ESA)

N85-24860# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE STABILITY OF PREDICTOR-CORRECTOR METHODS FOR PARABOLIC EQUATIONS WITH DELAY
P. J. vanderHouwen, B. P. Sommeijer, and C. T. H. Baker (Manchester Univ.) Aug. 1984 20 p refs Submitted for publication
(CWI-NM-R8410; B8475631) Avail: NTIS HC A02/MF A01

General predictor-corrector (GPC) methods for parabolic equations (PE) with delay are discussed. The GPC consist of an (explicit) linear multistep predicator an (implicit) linear multistep and an (unconventional) iteration scheme. The efficient numerical solution of classical PE can be accomplished for stiff differential equations via GPC. Diffusion problems with technical conditions are considered. Numerical experiments which illustrate results are reported. Author (ESA)

N85-24861# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE SHIFT PARAMETER IN THE BACKWARD BEAM METHOD FOR PARABOLIC PROBLEMS FOR PRECEDING TIMES
J. G. Verwer Aug. 1984 13 p refs Submitted for publication
(CWI-NM-R8411; B8475630) Avail: NTIS HC A02/MF A01

Backward beam method (BBM) for numerical solution of parabolic problems for preceding times is considered. The BBM in Hilbert space is discussed. The BBM examined consists in finding a solution on a compact interval given the terminal value of the finite dimensional ordinary differential equation (ODE) system which is assumed to represent a continuous time, semidiscrete approximation to the parabolic partial differential equation under consideration (method of lines). The BBM is interpreted as a standard finite difference method for two point boundary value problems for second order ODE systems. This method is influenced by the choice of a spectral shift parameter. The expression for the optimal value by use of logarithmic convexity arguments for linear problems is explained via the numerical stability analysis of the forward and backward recurrence involved. Author (ESA)

N85-24862# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
SQUARES OF GEGENBAUER POLYNOMIALS AND MILIN TYPE INEQUALITIES
T. H. Koornwinder Oct. 1984 8 p refs Submitted for publication
(CWI-PM-R8412; B8478824) Avail: NTIS HC A02/MF A01

The hypergeometric power series 3F2 is considered. It is a solution of differential equations which de Branges used for his proof of the Bieberbach conjecture. Milin's conjecture for the inequalities of convex hulls is proved. Milin's conjecture implies the Bieberbach Theorem. De Branges' solution is a nonnegative linear combination of hypergeometric power series. Gegenbauer polynomials are related to derivatives of hypergeometric power series. Author (ESA)

N85-24863# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
FINITE ELEMENT METHODS IN SOUTH AFRICA 1983
1984 702 p refs Conf. held in Pretoria, 17-20 Jan. 1984 Sponsored in part by South Africa Inst. for Aeronautical Engineers
(S-332; ISBN-0-7988-2692-4) Avail: NTIS HC A99/MF A01

Twenty-eight papers discussing various applications of the finite element method are compiled. Particular emphasis is given to problems in structural analysis; engineering problems in hydrodynamics, aerodynamics and microwave techniques are also addressed. M.G.

N85-24757 Centre National d'Etudes Spatiales, Toulouse (France).
FINITE ELEMENT METHODS IN SPACE MATHEMATICS [SUR LES METHODES D'ELEMENTS FINIS EN MATHEMATIQUES SPATIALES]
P. Altibelli *In its* Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 97-118 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24758 Centre National d'Etudes Spatiales, Toulouse (France)
SPHERIOIDAL FUNCTIONS: PROPERITES AND TABULATION. APPLICATION TO ANTENNA SYNTHESIS [FONCTIONS SPHEROIDALES PROPRIETES: TABULATION A LA SYNTHESE DES ANTENNES]
P. Dorio *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 119-161 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24759 Centre National d'Etudes Spatiales, Toulouse (France).
SOLVING LARGE LINEAR SYSTEMS [RESOLUTION DE GRANDS SYSTEMES LINEAIRES]
J. L. Lagouanelle *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 163-178 In FRENCH (For primary

document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24761 Centre National d'Etudes Spatiales, Toulouse (France).
ARITHMETIC AND ELEMENTARY FUNCTIONS ON MINI AND MICROCOMPUTERS [ARITHMETIQUE ET FONCTIONS ELEMENTAIRES SUR MINI-MICRO COMPUTERS]
J. C. Berges *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 193-229 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-25036*# Naval Observatory, Washington, D.C.
LEAST SQUARES REDUCTION TECHNIQUE
R. S. Harrington *In* JPL Cometary Astrometry 15 Nov. 1984 p 151-153 ref (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 12A

N85-25037*# Centro de Investigacion de Astronomia, Merida (Venezuela).
REDUCTION OF ASTROMETRIC PLATES
J. Stock *In* JPL Cometary Astrometry 15 Nov. 1984 p 154-159 ref (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-24864 Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
PROBALISTIC ANALYSIS OF COMBINATORIAL ALGORITHMS: AN ANNOTATED BIBLIOGRAPHY
R. M. Karp (California Univ., Berkeley), J. K. Lenstra, C. J. H. McDiarmid (Oxford Univ.), and A. H. G. Rinnooykan (Erasmus Univ.) Oct. 1984 30 p refs Submitted for publication
(CWI-OS-R8411; B8478778) Copyright. Avail: Issuing Activity

About 150 items on the probabilistic analysis of combinatorial algorithms for problems defined on (unweighted and weighted) graphs, Euclidean problems, linear programming, packing and covering problems, and branch-and-bound and local search methods are reviewed. Author (ESA)

N85-24865# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
ESTIMATION OF OPTIMUM SCORES FOR PARTITION DETECTORS USING STOCHASTIC APPROXIMATION TECHNIQUES
Basil P. Rabinowitz and Ludwik Kurz (Polytechnic Inst. of New York, Brooklyn) 1982 6 p refs Presented at the 16th Conf. on Inform Sci. and Systems, Princeton, N.J., 1982
Avail: NTIS HC A02/MF A01

The problem of estimating optimum scores for some robust detectors is considered. The detectors of interest are those in the class of partition statistics. These detectors are robust in the sense that a change in the environment will not degrade their performance significantly. The Robbins-Monro Stochastic Approximation algorithm is used to obtain recursive estimators. The difficulty with this method lies in choosing suitable regression functions which are in general not unique. In some cases, it is not possible to find a regression function for direct estimation. In such cases, indirect methods are used. Author

N85-24866# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
WEAK CONVERGENCE OF A SEQUENCE OF QUEUEING AND STORAGE PROCESSES TO A SINGULAR DIFFUSION
W. A. Rosenkrantz Nov. 1984 18 p
(Grant AF-AFOSR-0167-82)
(AD-A150655; AFOSR-85-0056TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It has been known for a long time that heavy traffic limit theorems in queueing theory are but a special case of the so-called diffusion approximation in Physics and Genetics. Take for example Kingman's (1962) heavy traffic approximation for the stationary waiting time distribution for a sequence of GI/GI/1 queues Q(sigma) depending on a parameter sigma. Denote the waiting time, excluding service, or the nth customer by W(n,sigma) and let U(n,sigma) = S(n,sigma) - T(n,sigma) where S(n,sigma) = service time of the nth cutstomer and T(n,sigma) = inter arrival time between the nth and (n + 1)st customer and assume E(U(n,sigma)) = variance of U(n,sigma) = sigma squared, sigma > 0. GRA

N85-24867# Stanford Univ., Calif. Lab. for Computational Statistics.
CLASSIFICATION AND MULTIPLE REGRESSION THROUGH PROJECTION PURSUIT
J. H. Friedman Jan. 1985 34 p
(Contracts N00014-83-K-0472; DAAG29-82-K-0056; DE-AC03-76SF-00515)
(AD-A150797; LCS-TR-12) Avail: NTIS HC A03/MF A01 CSCL 12/1

Projection pursuit regression is generalized to multivariate responses. By viewing classification as a special case, this generalization serves to extend classification and discriminant analysis via the projection pursuit approach. GRA

N85-24868# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
NONPARAMETRIC ESTIMATION OF DENSITY AND HAZARD RATE FUNCTIONS WHEN SAMPLES ARE CENSORED
W. J. Padgett 11 Jan. 1985 33 p
(Grant AF-AFOSR-0156-84)
(AD-A150946; TR-103; AFOSR-85-0107TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this article is to present the different types of nonparametric density estimates that have been proposed for the situation that the sample data are censored or incomplete. This type of data arises in many life testing situations and is common in survival analysis problems. Many of the methods of nonparametric density and hazard rate estimation from right-censored observations are discussed. These include histogram and kernel-type procedures, likelihood methods, Fourier series methods, and Bayesian nonparametric approaches. Examples of kernel density estimates are given for mechanical switch life data where data-based choices of the bandwidth values are used. GRA

N85-24869# Stanford Univ., Calif. Dept. of Statistics.
BOUNDARY CROSSING PROBABILITIES AND STATISTICAL APPLICATIONS Technical Report
D. Siegmund Jan. 1985 61 p
(Contract N00014-77-C-0306)
(AD-A151027; TR-32) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper surveys recent results involving boundary crossing probabilities and related statistical applications. The first part is concerned with problems of sequential analysis, especially repeated significance tests and their application to sequential clinical trials involving survival data. The second part develops the probability theory motivated by the problems of Part 1. A method for computing first passage distributions of Brownian motion to linear boundaries is introduced and then modified to handle problems in discrete time and those involving nonlinear boundaries. The third part is concerned with fixed sample statistical problems, especially change-point problems, which involve boundary crossing probabilities. Examples are given of problems for which methods of Part 2 appear adequate and of problems which require new methods. GRA

N85-24870# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
CONVOLUTION OF THE IFRA (INCREASING FAILURE RATE AVERAGE) SCALED-MINS CLASS
E. El-Neweihi and T. H. Savits Jan. 1985 10 p Prepared in cooperation with Illinois Univ., Chicago Circle

(Contract N00014-84-K-0084; Grant AF-AFOSR-0113-84)
(AD-A151070; AFOSR-85-0109TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In recent years various multivariate extensions of the univariate classes of life distributions that are important in reliability theory have been proposed. A survey of many of these classes may be found in Block and Savits (1981). In this paper we focus on one particular extension of the IFRA (Increasing Failure Rate Average) class due to Esary and Marshall (1979). GRA

N85-24871# Oak Ridge National Lab., Tenn.
MACRO FOR FITTING NONLINEAR MODELS TO POISSON DISTRIBUTED DATA
E. L. Frome and R. McLain 1984 13 p refs Presented at SUGI Conf., Hollywood, Fla., 18 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE84-008569; CONF-8403108-2) Avail: NTIS HC A02/MF A01

Models are considered in which the dependent variable y is a count that follows the Poisson distribution. The expected value of y is represented with a regression function that describes the relation between the expected count, the predictor variables, and the parameters. Estimates of the parameters can be obtained using iteratively weighted least squares (IWLS). The IWLS procedure is equivalent to using the method of scoring to obtain a root of the likelihood equations. Poisson regression models include linear, log-linear, quasi-linear, and intrinsically nonlinear regression functions. This approach allows the analyst to concentrate on determining the most appropriate form of the regression function without regard for computational complexity. The SAS procedures NLIN and MATRIX can be used to obtain ML estimates, their estimated asymptotic covariance matrix, and diagnostic measures that can be used to aid the analyst in detecting outlying responses and extreme points in the model space. DOE

N85-24872# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
A NOTE ON EQUIVALENT RANDOM THEORY
E. A. vanDoorn Sep. 1984 8 p refs
(CWI-OS-R8410; B8478779) Avail: NTIS HC A02/MF A01

Two results which relate the mean and the peakedness factor of the overflow traffic resulting when Poisson traffic with intensity a is offered to a trunk group of size x, are proved. The results are known in equivalent random theory but no proofs were available. Author (ESA)

N85-24754 Centre National d'Etudes Spatiales, Toulouse (France).
PARAMETER ESTIMATION IN STOCHASTIC DYNAMIC SYSTEMS [ESTIMATION DES PARAMETRES DANS LES SYSTEMES DYNAMIQUES STOCHASTIQUES]
B. Truong-Van *In its* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 29-64 In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-24873*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DATA-LINK ALTERNATIVES FOR THE NASA PILOT DATA SYSTEMS
William C. Likens and Gerard Zichterman (Lockheed Missiles and Space, Sunnyvale, Calif.) Jan. 1985 21 p refs
(NASA-TM-85999; A-9842; NAS 1.15:85999) Avail: NTIS HC A02/MF A01 CSCL 12B

There are several preliminary, or pilot, efforts for developing data systems for supporting NASA science research. The Pilot Data Systems consist of the Pilot Land Data System (PLDS), the Pilot Ocean Data System (PODS), the Pilot Climate Data System (PCDS), and the Pilot Planetary Data System (PPDS). The PLDS is likely to have the greatest communication needs of the various pilots. Communications issues and requirements are examined in the context of the mature PLDS as it may exist by 1990. The PLDS is seen as a distributed processing system linking resources at a number of NASA research centers and outside universities. Large image data sets, including LANDSAT scenes, are a major data type to be moved along the PLDS communications network. The unusually large size of these data files requires examining new technologies that may allow efficient and affordable communication at rates of up to 60 megabits per second. Potentially useful developments include portable satellite ground stations, and time division multiple access for sharing high-speed satellite links. Further pooling of communications for the various data systems into a single network would reduce costs and may make economic justification of access to the required data rates possible. M.G.

N85-24874# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SIMPLE-MOTION PURSUIT-EVASION DIFFERENTIAL GAMES IN THE PLANE
M. Pachter and Y. Yavin Oct. 1983 117 p refs Submitted for publication
(CSIR-TWISK-336) Avail: NTIS HC A06/MF A01

Pursuit-evasion differential games in the plane are considered in which the players, i.e. the pursuer and the evader, have simple motion and are pedestrians a la isaacs. Two information patterns are considered, namely the classical feedback strategy and the stroboscopic pursuit strategy; loosely speaking, the later incorporates the instantaneous control employed by the evader, which is assumed to be known to the pursuer. Within this framework the question of modelling a pursuit-evasion encounter is addressed, and three well-known guidance schemes of the line of sight. collision in course and proportional navigation types are examined. M.G.

N85-24875# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
STOCHASTIC PURSUIT-EVASION DIFFERENTIAL GAMES IN THE PLANE
Y. Yavin Feb. 1984 41 p refs Submitted for publication
(CSIR-TWISK-343) Avail: NTIS HC A03/MF A01

Four stochastic pursuit-evasion differential games involving two players, P and E, moving in the plane are considered. The difference between the games lies in their information structures. In each of the games sufficient conditions on optimal feedback strategies, in the cases of complete information, and on weak optimal feedback strategies, in the cases of incomplete information, are derived. Optimal strategies are computed for the cases of complete information and weak suboptimal strategies for the cases of incomplete information. The results indicate that the correct measurement of the direction of the segment PE is more important than the measurement of the distance (P,E). M.G.

N85-24876# Naval Postgraduate School, Monterey, Calif.
SOME APPLICATIONS OF FUZZY SETS AND THE ANALYTICAL HIERARCHY PROCESS TO DECISION MAKING M.S. Thesis
A. C. Rosas Sep. 1984 74 p
(AD-A150720) Avail: NTIS HC A04/MF A01 CSCL 12/2

This thesis examines the use of fuzzy set theory and the analytic hierarchy process in decision making. It begins by reviewing the insight of psychologists, social scientists and computer scientists to the decision making process. The Operations Research-Systems Analysis approach is discussed followed by a presentation of the basis of fuzzy set theory and the analytic hierarchy process. Two applications of these methods are presented. The first uses fuzzy sets and a little of the analytic hierarchy process to solve an hypothetical decision problem for the commanding officer of a naval task force. The second applies the latter technique and estimated data to the problem of choosing the best alternative to provide quality air service to Mexico City. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-24877# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
PADE TABLES OF A CLASS OF ENTIRE FUNCTIONS
D. S. Lubinsky Oct. 1983 15 p refs Submitted for publication (CSIR-TWISK-337) Avail: NTIS HC A02/MF A01

It is shown that if the Maclaurin series coefficients (a sub j) of an entire function satisfy a certain explicit condition, then there exists a sequence S of integers such that [L/M sub L] approaches F locally uniformly in C as L approaches infinity, L is an element of S, integer sequences (M sub L) from L = 1 to infinity. In particular, this condition is satisfied if the (A sub J) approach 0 fast enough, or if a subsequence of the (A sub J) behaves irregularly in a certain sense. Further, the functions satisfying this condition are dense in the space of entire functions with the topology of locally uniform convergence. Consequently, the set of entire functions satisfying the Baker-Gammel-Wills Conjecture is of the second category. M.G.

N85-24878# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON LOCALIZATION OF INJECTIVE MODULES
C. Naude and G. Naude Feb. 1984 15 p refs Submitted for publication
(CSIR-TWISK-342) Avail: NTIS HC A02/MF A01

It is not true in general, that localization preserves injectivity. It is shown that if a regular injective R-module, E. is localized at a maximal ideal M, then E sub M is an S-injective R sub M module (where S is the image of the regular elements in R sub M provided that R is h-local. The converse is also true, i.e., if E sub M is S-injective for all maximal ideals M, then E is regular injective. If, in addition, R is an order in a semi-simple ring, then E is an injective R module if and only if E sub M is an injective R sub M-module. If E is regular torsion-free the condition that R must be h-local is redundant. M.G.

N85-24879# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
TOPOLOGY AND ORDER STRUCTURES, PART 2
H. R. Bennett, ed. and D. J. Lutzer, ed. 1983 123 p refs Presented at 2nd Workshop Meeting held in Amsterdam, Aug. 1981 Sponsored by NATO and Free Univ., Amsterdam
(MCT-169-Pt-2; B8404117; ISBN-90-6196-266-8) Avail: NTIS HC A06/MF A01

Linearly ordered topological spaces and generalized ordered spaces (GO-spaces) are considered. Topics related to compact spaces and GO-spaces are studied. Characterization of GO-spaces is given. For individual titles, see N85-24880 through N85-24892.

N85-24880# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
TWENTY QUESTIONS ON ORDERED SPACES
D. J. Lutzer *In its* Topology and Order Struct., Pt. 2 1983 p 1-18 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Questions on generalized ordered (GO) spaces are posed. Questions concern compacity and metrizability properties on GO-spaces; connectnedenss; and geometric properties for applied Hahn-Mazurkiewicz theorem. Author (ESA)

N85-24881# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
A NOTE ON PERFECT NORMALITY IN GENERALIZED ORDERED SPACES
H. Bennet and D. J. Lutzer *In its* Topology and Order Struct., Pt. 2 1983 p 19-22 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Perfect normality in generalized ordered (GO-spaces) spaces is studied. That perfectly normal spaces and perfectly K-normal spaces are synonomous on GO-spaces is proved. Author (ESA)

N85-24882# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
METRIZATION THEOREMS FOR CONTINUOUS IMAGES OF COMPACT ORDERED SPACES
W. Bula *In its* Topology and Order Struct., Pt. 2 1983 p 23-29 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

It is proved that an open infinite-to-one continuous image of a space which is a continuous image of a compact ordered space is metrizable. Author (ESA)

N85-24883# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
A PATHOLOGICAL HOMOGENEOUS SUBSPACE OF THE REAL LINE
A. J. M. vanEngelen and J. vanMill *In its* Topology and Order Struct., Pt. 2 1983 p 31-36 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Separable metric spaces are considered. A subspace of real line which contains a countable dense subset such that its complement has only one autohomomorphism trivial, is constructed. This phenomena is a pathological class of strongly homogeneous space. Author (ESA)

N85-24884# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
A NOTE ON TOPOLOGICAL GROUPS WITH DENSE ORDERABLE SUBSPACES
R. Fox *In its* Topology and Order Struct., Pt. 2 1983 p 37-38 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

It is proved that a topological group which has a dense linearly orderable subspace (not necessarily a subgroup) which is either metrizable or topologically orderable exists. Author (ESA)

N85-24885# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
THE KAPPA SUB n PROPERTY IN SMALL OMEGA SUB 1 TREES
K. P. Hart *In its* Topology and Order Struct., Pt. 2 1983 p 39-46 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Kn-spaces are considered. Kn-topological space properties in the class of W1-trees are studied. Ki-trees and Ko-trees are shown to be retractable. Kn-property is proved to be equivalent to collection wise (CWN) Hausdorffness for $n > 2$. The gap between K2 and K1 is very wide. That one-point compactification of a locally compact Kn-space is again Kn is proved. A one-point compactification of a Souslin tree which is a compact K2-space, but is not K1 is shown to exist. Author (ESA)

N85-24886# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ON COMPACTIFICATIONS OF GENERALIZED ORDER GO-SPACES
J. Pelant *In its* Topology and Order Struct., Pt. 2 1983 p 47-51 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Methods for the existence of connected compactification of Sorgenfrey line are discussed. Classical results are reported. Author (ESA)

N85-24887# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
THE ORDERABILITY OF COMPACT SCATTERED SPACES
S. Purisch *In its* Topology and Order Struct., Pt. 2 1983 p 53-61 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01

Examples of orderable compact scattered spaces are given.

That Baker's results and Moran's theorem enable a characterization of orderable compact scattered spaces, is proved. Author (ESA)

N85-24888# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
SUBMETRIZABLE TOPOLOGIES ON THE ORDINALS
G. M. Reed *In its* Topology and Order Struct., Part 2 1983 p 63-64 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01
Submetrizable topologies on the ordinals are studied. Author (ESA)

N85-24889# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
WHEN IS A GO-SPACE JO(2)?
B. M. Scott *In its* Topology and Order Struct., Pt. 2 1983 p 65-71 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01
Technical properties of generalized ordered space (X) when its topology can be represented as the join of 2-linear order topologies on the set X are examined. Author (ESA)

N85-24890# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
LOCAL BASES AND PRODUCT PARTIAL ORDER II
B. M. Scott *In its* Topology and Order Struct., Pt. 2 1983 p 73-80 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01
Globular spaces are studied. Author (ESA)

N85-24891# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
MAPPINGS OF FINITE OSCILLATIONS AT LOCAL SEPARATING POINTS
L. B. Treybig *In its* Topology and Order Struct., Pt. 2 1983 p 81-89 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01
It is proved that a continuous map f when f is of finite oscillation at local separating points of the unity interval to locally connected metric continuum space M such that no points separate M, exists. Author (ESA)

N85-24892# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ORDERABLE SUBSPACES OF COMPACT F-SPACES
S. W. Williams *In its* Topology and Order Struct., Pt. 2 1983 p 91-105 refs (For primary document see N85-24879 14-67)
Avail: NTIS HC A06/MF A01
Parovicenko spaces are constructed. It is proved that a compact almost-P, F-space of weight C possessing a dense orderable subspace exists. Author (ESA)

N85-24893# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
FAKE TOPOLOGICAL HILBERT SPACES AND CHARACTERIZATIONS OF DIMENSION IN TERMS OF NEGLIGIBILITY
J. J. Dijkstra 1984 119 p refs
(CWI-TRACT-2; B8424023; ISBN-90-6196-268-4) Avail: NTIS HC A06/MF A01
Hilbert spaces, metrizables that share many topological properties with square-integrable spaces, but are not homeomorphics are studied. Strong negligibility properties of square-integrables are described by the sigma-compacity subspaces of a sequence of fake Hilbert spaces. Author (ESA)

N85-24894# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
SYSTEM THEORETIC DESCRIPTION OF PHYSICAL SYSTEMS
A. J. vanderSchaft 1984 274 p refs
(CWI-TRACT-3; B8425111; ISBN-90-6196-269-2) Avail: NTIS HC A12/MF A01
Hamiltonian systems from a system theoretic point of view are studied. Relations between system theory and (mathematical) physics is reported. Hamiltonian systems form a subclass of (nonlinear) systems. System theoretic interests in Hamiltonian systems is applied to optimal control, filtering and signal processing and contributes to the formalization of the external force. From a system theoretic point of view gradient systems are more complex than Hamiltonian systems. A symmetry for a Hamiltonian system corresponds to a conservation law and viceversa. Extension of Noether's theorem is shown. Author (ESA)

N85-24895# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
INTERTWINING FUNCTIONS ON COMPACT LIE GROUPS
B. Hoogenboom 1984 94 p refs
(CWI-TRACT-5; B8471222; ISBN-90-6169-271-4) Avail: NTIS HC A05/MF A01
Spherical functions on Reimannian symmetric space of the compact type of rank finite are discussed. Spherical functions can be interpreted as left and right invariant functions (interwining functions) on a compact semisimple Lie group. Vretare's Theorem is expandend. Complex semisimple Lie algebras with two commuting involutions are considered. That interwining functions on a compact Lie group are orthogonal polynomials is proved. Results obtained by this method can be used in other models of Lie algebras. Author (ESA)

N85-24896# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
DISPROOF OF THE MERTENS CONJECTURE
A. M. Odlyzko (Bell Telephone Lab., Murray Hill, N.J.) and H. J. J. teRiele Sep. 1984 22 p refs Submitted for publication
(CWI-NM-R8412; B8478814) Avail: NTIS HC A02/MF A01
Mertens conjecture, i.e., that the difference between the number of squarefree positive integers $n < x$ with an even number of prime factors and of those with an odd number of prime factors is < square root of x is disproved. Mertens conjecture is equivalent to Riemann Zeta (RZ) function. Disproof of Mertens conjecture does not imply anything about the possible falsity of the RZ which is verified up to 1 billion. Author (ESA)

N85-24897# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
NUMERICAL SOLUTION OF A FIRST KIND FREDHOLM INTEGRAL EQUATION ARISING IN ELECTRON-ATOM SCATTERING
H. J. J. teRiele and R. W. Wagenaar Nov. 1984 11 p refs Presented at Conf. on Konstruct. Meth. zur Praktischen Behandlung von Integralgleichungen, Oberwolfach, West Germany, 24-30 Jun. 1984
(CWI-NM-R8414; B8478816) Avail: NTIS HC A02/MF A01
Regularization methods for numerically solving first kind Fredholm integral equations are studied. Numerical solution of an integral equation arising in electron-atom scattering is given. This method gives the best results in a qualitative sense and the numerical solution obtained for the physical problem is the best result that can be obtained. Author (ESA)

N85-24898# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Div. of Numerical Mathematics.
SOME HISTORICAL AND OTHER NOTES ABOUT THE MERTENS CONJECTURE AND ITS RECENT DISPROOF
H. J. J. teRiele Nov. 1984 9 p refs Submitted for publication
(CWI-NM-R8415; B8478817) Avail: NTIS HC A02/MF A01
Historical and biographical aspects of the Mertens conjecture and its disproof are discussed. Author (ESA)

N85-24899# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON POSITIVE VECTORS, POSITIVE MATRICES AND THE SPECIALIZATION ORDERING
M. Hazewinkel Sep. 1984 11 p refs Submitted for publication
(CWI-PM-R8407; B8478826) Avail: NTIS HC A02/MF A01
Specialization partial ordering is discussed. Properties between specialization order and positive rank of nonnegative matrices are

given. Characterizations of specialization order by measuring functions or gauge functions are reported. Author (ESA)

N85-24900# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
A CONVEXITY THEOREM FOR SEMISIMPLE SYMMETRIC SPACES
E. P. vandenBan Nov. 1984 47 p refs Submitted for publication
(CWI-PM-R8414; B8478827) Avail: NTIS HC A03/MF A01

Konstant's theorem on the factor group G/H of a connected real semisimple symmetric Lie group G with finite center by an invariant subgroup H of an involution of G, is proved. Konstant's convexity theorem for semisimple symmetric spaces is generalized. Iwasawa's projection on this group is studied. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-24901# Texas Univ., Austin. Electronics Research Center.
ANNUAL REPORT ON ELECTRONICS RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN Annual Report, 1 Apr. 1983 - 31 Mar. 1984
E. J. Powers 15 May 1984 109 p
(Contract F49620-82-C-0033)
(AD-A150836; AFOSR-85-0160TR; AR-31) Avail: NTIS HC A06/MF A01 CSCL 20/3

This report summarizes progress on projects carried out at the Electronics Research Center at The University of Texas at Austin and which were supported by the Joint Services Electronics Program. In the area of Information Electronics progress is reported for projects involving: (1) nonlinear estimation and detection, (2) electronic time-variant signal processing, and (3) digital time series analysis with applications to nonlinear wave phenomena. In the Solid State Electronics area recent findings in: (1) solid state interface reactions and instabilities, (2) electronic properties and structure of metal silicides and interfaces, and (3) implantation and interface properties of InP and related compounds are described. In the Quantum Electronics area progress is presented for the following projects: (1) quantum effects in laser induced damage, (2) nonlinear Raman scattering from molecular ions, and (3) nonlinear optical interactions. In the Electromagnetics area progress in guided waves in composite structures is summarized. GRA

N85-24902# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
SPLINE TECHNIQUES FOR MAGNETIC FIELDS
John G. Aspinall 8 Jun. 1984 72 p refs
(Contract DE-AC02-78ET-51013)
(DE85-004919; DOE/ET-51013/98; PFC/RR-83-27) Avail: NTIS HC A04/MF A01

An overview of B-spline techniques, oriented toward magnetic field computation is presented. These techniques form a powerful mathematical approximating method for many physics and engineering calculations. The concept of a polynomial spline is introduced. A spline with well chosen properties, the B-spline, can be used to build any spline. The description of how to solve a simple spline approximation problem is completed, and some practical examples of using splines are shown. All these sections deal exclusively in scalar functions of one variable for simplicity. Techniques that are not B-spline techniques, but are closely related, are covered. These methods are not needed for what follows, until the last section on errors. A second group is formed which works toward the final goal of using B-splines to approximate a magnetic field. How to approximate a scalar function of many variables is demonstrated. The necessary mathematics is completed, where the problems of approximating a vector function in general, and a magnetic field in particular, are examined. Finally some algorithms and data organization are shown. DOE

N85-24118# Joint Publications Research Service, Arlington, Va.
STABILITY OF PERMANENT ROTATION MODES OF ASYMMETRIC HEAVY SOLID BODY Abstract Only
D. V. Andreyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 78-79 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 3, May - Jun. 1983 p 372-377 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24120# Joint Publications Research Service, Arlington, Va.
STABILITY OF STEADY MOTIONS OF DYNAMICALLY SYMMETRICAL SOLID AT A TRIANGULAR LIBRATION POINT Abstract Only
V. N. Ruzanova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 80 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 337-340 Original language document was announced in IAA as A83-32362 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24122# Joint Publications Research Service, Arlington, Va.
STABILIZATION OF STEADY MOTION OF MECHANICAL SYSTEMS Abstract Only
E. M. Krasinskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 81 Transl. into ENGLISH from Prikl. Mat. i Mekhan. (Moscow), v. 47, no. 2, Mar. - Apr. 1983 p 302-309 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N85-24903 Pennsylvania State Univ., University Park.
ACOUSTIC RADIATION FROM BILAMINAR PLATES Ph.D. Thesis
Il-Bok Joung 1984 193 p
Avail: Univ. Microfilms Order No. DA8429096

A model of the dynamic response of a bilaminar composite plate was obtained by using energy methods. The displacement yield is based on symmetric and anti-symmetric displacement functions in both the thickness stretch and the thickness shear of each layer. From this model, the Timoshenko-Mindlin thick plate theory and the Bernoulli-Euler classic plate theory can be recovered as the special limiting cases. For the bilaminar plate, a six-branched frequency-wavenumber spectrum and the corresponding coincidence angle-wavenumber and coincidence angle-frequency spectra are computed. The reflection and transmission coefficients of acoustic plane waves were obtained for single plates and bilaminar composite plates. Also, the acoustic impedance of the bilaminar composite plate was computed at the contact surface between the upper layer and the acoustic medium. The acoustic pressure directivity functions were obtained for a single plate and bilaminar composite plate which are excited by either a normal or a shear line force. The influence of structural damping on the directivity functions due to normal and shear forces is investigated. Dissert. Abstr.

N85-24904*# Bionetics Corp., Hampton, Va.
SOUND PROPAGATION STUDIES FOR A LARGE HORIZONTAL AXIS WIND TURBINE
Kevin P. Shepherd and Harvey H. Hubbard (College of William and Mary) Mar. 1985 45 p refs
(Contract NAS1-16978; Grant NAG1-166)
(NASA-CR-172564; NAS 1.26:172564) Avail: NTIS HC A03/MF A01 CSCL 20A

Systematic noise measurements in three directions with respect to the wind vector, over a range of distances to 1050 m, over a

range of frequencies from 8 Hz to 2000 Hz, and for a stable wind turbine noise source (WTS-4) in windy conditions (V = 9.4 to 13.0 m/s) are presented. At frequencies above 63 Hz in the downwind and crosswind directions the sound pressure levels decay with distance according to predictions based on atmospheric absorption and spherical spreading, assuming no excess attenuation due to ground effects. In the upwind direction there is excess attenuation due to an acoustic shadow zone. The assumption of a distributed noise source leads to better noise estimates in the upwind direction. For very low frequencies 8 to 16 Hz no excess attenuation was observed in the upwind direction at distances up to 1050 m and a sound pressure level decay rate of approximately 3 dB per doubling of distance was observed in the downwind direction. Author

N85-24905# Stanford Univ., Calif. Lab. of Physics.
PHOTOACOUSTIC IMAGING Final Report, 30 Jun. 1982 - 29 Jun. 1984
C. C. Williams and C. F. Quate Oct. 1984 106 p
(Grant AF-AFOSR-0248-82)
(AD-A150823; GL-3777; AFOSR-85-0124TR) Avail: NTIS HC A06/MF A01 CSCL 14/5

This is the final report on the work done in the area of high resolution photoacoustic and photothermal imaging. It contains recent advances in photoacoustic and photothermal theory and the experimental demonstration of new techiques. Photoacoustic and photothermal theories have been extended to include the effects of the highly focused optical power sources necessary for high resolution imaging and three high frequency techniques (1 GHz) have been demonstrated and used to characterize the material properties of solids. The formalism behind photothermal characterization of solids is established under general focusing conditions. The three dimensional thermoacoustic field equation is derived and discussed. Two high resolution photoacoustic techniques have been demonstrated. These techniques involve the use of an acoustic lens for collection for the acoustic power generated by a highly focused optical beam modulated at 1 GHz frequency. Images of gold and laser recrystallized silicon films are presented demonstrating the high resolution and sensitivity of these techniques. A high resolution photothermal probe has been demonstrated. This optical technique provides a means of photothermal characterization with submicrometer resolution and high sensitivity. The theory behind the probe is presented along with the experimental verification. Images of boron implanted silicon are included which demonstrate the resolution and sensitivity of this technique. GRA

N85-24906# Naval Sea Systems Command, Washington, D.C.
A MULTI-ELEMENT ULTRASONIC RANGING ARRAY Final Technical Report
B. Everett Jan. 1985 35 p
(AD-A150898; NAVSEA-450-90G-TR-0001) Avail: NTIS HC A03/MF A01 CSCL 17/1

A Multi-Element Ultrasonic Ranging Array describes the use of an array of multiple transducers combined with dedicated microprocessor capabilities in the development of a high resolution ultrasonic rangefinding system. The system design utilizes Texas Instruments' Ultrasonic Ranging Modules and Polaroid Electrostatic Transducers interfaced through a specially designed multiplexer to a controlling microprocessor. Author (GRA)

N85-24907# California Univ., Los Angeles.
PROPAGATION OF SOUND IN MATTER Final Report, 2 Feb. 1982 - 31 Dec. 1984
I. Rudnick Feb. 1985 8 p
(Contracts N00014-75-C-0246; N00014-67-A-0111; DA Proj. RR0-1108)
(AD-A151013; FR-1) Avail: NTIS HC A02/MF A01 CSCL 20/1

For Abstract see Annual Summary Report N00014-75-C-0246 1/1/84-12/31/84, Interim Summary Report N00014-67-A-0111-0019, N00014-69-A-0200-4014, N00014- 75-C-0246 10/1/68 - 2/1/82 and Final Report Task Order 233(48)1948 - 10/1/68. This report only lists reports, journal articles and a short description of research completed. GRA

N85-24908# California Univ., Los Angeles.
PROPAGATION OF SOUND IN MATTER Annual Summary Report, 1 Jan. - 31 Dec. 1984
I. Rudnick 31 Dec. 1984 10 p
(Contract N00014-75-C-0246; DA Proj. RR0-1108)
(AD-A151052; ASR-1) Avail: NTIS HC A02/MF A01 CSCL 20/2

The most important results of three contract projects are described. (1) Self-Trapping Hydrodynamic Soliton: Our major effort here has been to measure the amplitude dependent properties of the soliton. (2) Subharmonics, Bifurcations, Quasiperiodicity and Chaos in Continuous Media: In our first publication of our results in the Fall of 1981 we reported observing many subharmonic spectra and most of the fundamental subharmonics had frequencies which could not be reached by a period doubling cascade out of an observed group of 16 only 3 could be reached by period doubling. Robert Keolian has made many, many more measurements since then and the situation remains unchanged. (3) Sound Propagation In Superfluid Helium With Partially Locked Normal Component: We would like to use our extensive past experience with this mode to measure the details of the transition from ordinary (or first) sound propagation to fourth sound propagation. We expect that the results will be of great interest to the general problem of the multiple scattering of sound in a random porous medium. GRA

N85-24909# Sandia Labs., Albuquerque, N. Mex.
PARAMETRIC COHERENCE ESTIMATION VIA CONVOLVED CORRELATIONS
J. A. Cadzow, C. M. Solomon, Jr., and S. D. Stearns 1985 12 p refs Presented at Intern. Conf. on Acoustics, Speech and Signal Processing (ICASSP), Tampa, Fla., 26 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-003946; SAND-84-2526C; CONF-850399-1) Avail: NTIS HC A02/MF A01

The magnitude squared (MS) coherence is computed by estimating the parameters of a single polynomial ratio. The parameters are constrained so that the estimated MS coherence is real valued on the unit circle. The method first estimates the auto and cross correlation lags from raw data sequences. The auxiliary sequences (a(n)) and (b(n)) are defined as the convolution of the cross correlation function with itself and the convolution of the two autocorrelation functions, respectively. The MS coherence parameters will nearly satisfy a homogeneous set of equations involving the sequences (a(n)) and (b(n)). This system of linear equations is solved via an eigenspace decomposition. The algorithm is compared with two traditional periodogram based estimation methods. DOE

N85-24910# Institut Franco-Allemand de Recherches, St. Louis (France).
LOCALIZATION OF SOURCES OF EQUIVALENT NOISE IN FAST COLD JETS, EXCITED AND NONEXCITED [LOCALISATION DES SOURCES DE BRUIT EQUIVALENTES DANS DES JETS FROIDS RAPIDES, EXCITES, ET NON EXCITES]
Martin Schaffar 4 Jan. 1983 7 p refs In FRENCH Presented at 11th Congres Intern. d'Acoustique, Paris, 19-27 Jul. 1983
(ISL-CO-201/83) Avail: NTIS HC A02/MF A01

Based on the Lighthill acoustic analogy and the Ribner-Siddon causality principle, three complementary noise investigation methods are described. These are the correlation between the velocity and the acoustic pressure; the correlation velocity-pressure measured with an elliptic mirror; and the correlation between acoustic pressure and density variations. Laser velocimeters, interferometers and microphones are used in the experimental set-up. Convergent results are found: the low frequency active acoustic zone is the transition zone for the angles close to the axis. At higher frequencies the mixing zone is predominant in the generation of radiated noise. Shear noise is more important than self noise till a 45 deg angle. Author (ESA)

N85-23788# Kaman Aerospace Corp., Bloomfield, Conn.
TRANSMISSION OF GEAR NOISE TO AIRCRAFT INTERIORS PREDICTION METHODS
Alex Berman *In* GARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 7 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-23791# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
GEAR NOISE ORIGINS
William D. Mark *In* AGARD Gears and Power Transmission Systems for Helicopters and Turboprops Jan. 1985 14 p refs (For primary document see N85-23765 14-05)
Avail: NTIS HC A17/MF A01

N85-24102# Joint Publications Research Service, Arlington, Va.
ABATEMENT OF NOISE AND VIBRATION IN PIPELINES OF HYDRO SYSTEMS Abstract Only
R. A. Dashevskiy, Yu. P. Shchevyev, V. F. Rudenko, and V. V. Vechirko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 68 Transl. into ENGLISH from Energrt. i Elektr. (Kiev), no. 1, Jan. - Mar. 1983 p 19-21 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24144# Joint Publications Research Service, Arlington, Va.
APPLICATIONS OF ULTRASONIC TECHNOLOGY
Ma Yunjie *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-012) 23 Apr. 1985 p 41-42 Transl. into ENGLISH from Yiqi Yu Weilai (Peking), no. 12, 1984 p 5 (For primary document see N85-24140 14-31)
Avail: NTIS HC A04/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-24911# New Mexico Univ., Albuquerque. Dept. of Mathematics and Statistics.
NONRELATIVISTIC KAPITZA-DIRAC SCATTERING
E. A. Coutsias and J. K. McIver Nov. 1984 57 p
(Grant AF-AFOSR-0277-82)
(AD-A150649; AFOSR-85-0068TR) Avail: NTIS HC A04/MF A01 CSCL 20/8

The authors use techniques of Singular Perturbation theory to investigate the scattering of nonrelativistic charged particles by a standing light wave (Kapitza-Dirac scattering). Unlike previous treatments, they give explicit results for the effects of the time dependent part of the field. For low field intensity/low particle energy they show that the leading order effects can be found from an averaged equation and they compute corrections. For the strong fields that can be produced by modern lasers and/or high particle energies they show that the time dependence of the potential leads to focusing. Their methods can be applied to other problems with time-periodic potentials. (Author). GRA

N85-24912# JAYCOR, Alexandria, Va.
EXPLOSIVE EMISSION CATHODE PLASMAS IN INTENSE RELATIVISTIC ELECTRON BEAM DIODES Final Report, Sep. 1980 - Aug. 1984
D. Hinshelwood Washington NRL 30 Jan. 1985 215 p
(Contracts N00014-83-K-2024; DE-A108-79DP-40092)
(AD-A150669; NRL-MR-5492) Avail: NTIS HC A10/MF A01 CSCL 20/7

An experimental study of cathode plasmas in planar diodes driven by a Sandia Nereus accelerator (270 kV, 60 kA, 70 ns), with particular attention devoted to plasma uniformity and expansion velocity, has been carried out. This diode current density was varied over a factor of ten and the rate of rise of the applied field dE/dt was varied over a factor of six. Different cathode materials, coatings, and surface roughnesses were used and the effects of glow discharge cleaning and in situ heating of the cathode were examined. Framing photography, electron beam dosimetry, perveance measurements, optical interferometry, and (spatially and temporally resolved) spectroscopy were used to diagnose the plasma uniformity, electron beam uniformity, plasma front motion, electron density, plasma composition, motion of distinct species, electron temperature, and ion (and neutral) densities. Electron beam uniformity is seen to be related to cathode plasma uniformity; this uniformity is enhanced by a high value of (the microscopic) dE/dt, which is determined both by the rise time of the applied field and by the cathode surface roughness. The significance of dE/dt is believed to be related to the screening effect of emitted electrons. A simple cathode plasma model, which explains the similarity of plasmas in diodes with greatly differing parameters, is proposed. The relevance of these results to inductively driven diodes, repetitively pulsed diodes, and magnetically insulated transmission lines is also discussed. GRA

N85-24913# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THEORETICAL AND EXPERIMENTAL STUDIES OF STABILIZED METASTABLE HELIUM Final Report, 1 May - 30 Sep. 1984
J. S. Zmuidzinas 30 Nov. 1984 8 p
(Grant AF-AFOSR-ISSA-84-00049)
(AD-A150706; AFOSR-85-0011TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Numerical calculations have shown that the atomic phase of He IV (bulk spin-polarized triplet helium) should have a face-centered cubic crystals structure. A new, metallic phase of He IV has been discovered and shown to have lower energy than the atomic phase. A fundamental model of metallic He IV has been formulated which includes electron spin-spin and spin-orbit interactions as well as the coupling to the radiation field. The problem of metastability of metallic He IV has been formulated mathematically and will be used for future numerical calculations. A physical mechanism has been identified which might be instrumental in stabilizing metallic He IV. GRA

N85-24914# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
INTERMOLECULAR ENERGY TRANSFER BETWEEN THE INDIVIDUAL ZERO-FIELD LEVELS OF TRIPLET TRAPS IN AN ORIENTATIONALLY DISORDERED SOLID Interim Technical Report
H. S. Niederwald and M. A. El-Sayed 5 Feb. 1985 21 p
(Contract N00014-83-K-0341)
(AD-A150751; TR-44) Avail: NTIS HC A02/MF A01 CSCL 20/8

The zero-field transitions and levels of the phosphorescing triplet state of the traps in the orientationally disordered crystal of 1-bromo-4-chloro-naphthalene (BCN) are assigned by using phosphorescence-microwave double resonance techniques at 1.8 K. The relative population of the different zero-field levels are determined at different delays after singlet-singlet excitation and as a function of the energy of the emitting traps within the inhomogeneously broadened bands. For the same delay, the population of the radiating level is found to have a maximum which is at a lower energy within the inhomogeneous profile than that for the dark level. This observation is contrary to predictions based on one-dimensional exchange mechanisms and might suggest the involvement of dipole-dipole coupling for the triplet-triplet energy migration at the relatively large distances involved in the energy transfer between the traps. GRA

N85-24915# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
LIFETIME AND RELIABILITY OF RUBIDIUM DISCHARGE LAMPS FOR USE IN ATOMIC FREQUENCY STANDARDS
C. H. Volk, R. P. Frueholz, T. C. English, T. J. Lynch, and W. J. Riley 14 Dec. 1984 57 p Prepared in cooperation with EG&G, Inc., Salem, Mass.
(Contract F04701-83-C-0084)
(AD-A150787; TR-0084A(5404-30)-1; SD-TR-84-55) Avail: NTIS HC A04/MF A01 CSCL 13/1

The results of various studies concerning the lifetime and reliability of the rubidium discharge lamp used in the rubidium atomic frequency standards are reported. The primary life-limiting process in these lamps involves diffusion of the rubidium atoms into the glass envelope of the lamp, making them unavailable to the discharge. The rate at which rubidium atoms diffuse into the glass is dependent on lamp conditions, including lamp size, type of glass, lamp temperature, and rf drive power. The calorimetric technique to measure the elemental rubidium content in a lamp and its use for quality control in the lamp manufacturing process are discussed. GRA

N85-24916# RAND Corp., Santa Monica, Calif.
RADIO FREQUENCY QUADRUPOLE AND ALTERNATING PHASE FOCUSING METHODS USED IN PROTON LINEAR ACCELERATOR TECHNOLOGY IN THE USSR Interim Report
Nikita Wells Jan. 1985 87 p
(Contract MDA903-82-C-0067)
(AD-A150830; RAND/R-3141-ARPA) Avail: NTIS HC A05/MF A01 CSCL 20/7

The RFQ system has been especially effective in providing the practical means of approaching the space propagation criteria of high current level, low injection energy, adequate reliability, efficiency, and moderate size. Another method of simultaneous acceleration and focusing of ions under Soviet development has been the alternating phase focusing (APF) system, which has recently achieved a successful feasibility proof. GRA

N85-24917# Battelle Columbus Labs., Ohio.
MILLIMETER-WAVE DIFFRACTION DEVICES AND MATERIALS Final Report, 1 Sep. 1982 - 31 Oct. 1984
M. R. Seiler and R. W. Ridgway 28 Dec. 1984 140 p
(Contract F49620-82-C-0099)
(AD-A150876; AFOSR-85-0131TR) Avail: NTIS HC A07/MF A01 CSCL 20/8

Experimental results of a study to explore millimeter-wave beam-steering by techniques of diffraction are presented. When periodic structures, such as metallic gratings, are brought into proximity with a dielectric waveguide, radiation or reception of radiation at a controlled angle is possible. The direction of the beam is controlled by the period of the grating while the half-power beamwidth is controlled by the total length of the grating. Results are given for a variety of gratings formed by metallic blocks, ferro-fluid, and springs. Photoconductive gratings, varistors, and bulk acoustic wave devices were among other techniques researched in this program. Results indicate that the laser-excited photoconductive grating has promising potential for rapid beam steering. Author (GRA)

N85-24918# Argonne National Lab., Ill.
CHARACTERIZATION OF ATOMIC DEFECTS AND THEIR AGGREGATES USING POSITRON ANNIHILATION SPECTROSCOPY
R. W. Siegel, M. J. Fluss, and L. C. Smedskjaer Nov. 1984 9 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-006206; CONF-841157-65) Avail: NTIS HC A02/MF A01

Positrons localize in trapped states at a variety of defect sites in solids, from which they subsequently annihilate with unique observable characteristics. As such, the positron is a valuable probe for the study of these defects. Positron annihilation spectroscopy (PAS) has made significant contributions in recent years to the determination of atomic defect properties in metals and alloys, and in molecular solids as well. It has also been used extensively in the monitoring and characterization of vacancy-like microstructure development, as occurs during post-irradiation annealing. The characterization of defects using PAS is selectively reviewed and some possibilities for using the positron as a localized probe of the atomic and electronic structure of atomic defects and their aggregates are discussed. DOE

N85-24919# Fermi National Accelerator Lab., Batavia, Ill.
STANDARD MODEL AND BEYOND
C. Quigg Sep. 1984 19 p refs Presented at the US Summer School on High Energy Particle Accelerator, Batavia, Ill., 13 Aug. 1984
(Contract DE-AC02-76CH-03000)
(DE85-004269; FNAL/C-84-88-T; CONF-840873-4) Avail: NTIS HC A02/MF A01

The SU(3)/sub c/ circle crossSU(2)/sub L/circle crossU(1)/sub Y/ gauge theory of interactions among quarks and leptons is briefly described, and some recent notable successes of the theory are mentioned. Some shortcomings in the ability to apply the theory are noted, and the incompleteness of the standard model is exhibited. Experimental hints that Nature may be richer in structure than the minimal theory are discussed. DOE

N85-24920# Kentucky Univ., Lexington.
RESEARCH IN THEORETICAL NUCLEAR PHYSICS Progress Report, 1 Feb. - 31 Oct. 1984
Keh-Fei Liu 1984 6 p
(Contract DE-FG05-84ER-40154)
(DE85-006172; DOE/ER-40154/1) Avail: NTIS HC A02/MF A01

Progress is briefly described. The meson-nucleon scattering phase shifts are calculated for the Skyrme soliton with spin and isospin projections. The mixing of the S/sub 1/2/(6) and S/sub 1/2/(4) P/sub 3/2/(2) configurations in the MIT bag model is calculated and it shows a large effect. The production of Q(2) anti Q(2) mesoniums which decay to vector meson pairs are studied in (GAMMA)(GAMMA) reactions, hadronic collisions and J/psi radiative decays. A possible measurement of the quark gluon plasma temperature in relativistic heavy ion collisions is proposed. The vacuum to glueball transition amplitudes are measured in a lattice gauge Monte Carlo calculation. Fusion reactions of the polarized deuterons are calculated in DWBA formalism. An extended Skyrme-Landau effective NN interaction is being developed so that nuclear structure calculations can be carried out. Publications are listed. DOE

N85-24921# Brookhaven National Lab., Upton, N. Y.
GLUEBALL CANDIDATES
S. U. Chung 1984 22 p refs Presented at 12th Intern. Winter Meeting on Fundamental Phys., Santillana del Mar, Santa, Spain
(Contract DE-AC02-76CH-00016)
(DE85-003627; BNL-35367; CONF-8404215-1) Avail: NTIS HC A02/MF A01

With introduction of the gluon degree of freedom in the hadron spectroscopy, it is urgent that one searches for the expected gluon bound states in meson spectra. Those states are covered which can be interpreted as being glueballs, colorless and flavorless bound states with two or more gluons, produced in hadron-hadron collisions and in J/psi radiative decays. Glueball candidates are reviewed. So far, candidates have been reported in J/sup PC/ = O(++), 2(++) and O(-+) but none in the exotic J/sup PC/ such as 1(-+). E.R.

N85-24922# Illinois Univ., Chicago. Dept. of Physics.
PARTON DYNAMICS IN HADRONIC PROCESSES Final Report
Uday P. Sukhatme Jul. 1984 8 p refs
(Contract DE-AC02-83ER-40110)
(DE85-006072; DOE/ER-40110/2) Avail: NTIS HC A02/MF A01

Aspects of the dual parton fragmentation model for low transverse momentum multiparticle production in hadronic collisions previously developed were elucidated. In particular, it was verified that the dual parton model correctly reproduces recently obtained two particle inclusive distributions and particle ratios in the central region of pp and anti pp collisions. This sheds light on the dynamics of partons in a hadronic collision since it strongly indicates that a valence quark from each initial hadron is held back with a small momentum fraction. Also, the dual parton approach was extended to include diffraction dissocation and studied the consequences on inclusive pion production in pp interactions. The virtues and limitations of logarithmic perturbation theory, which is

often a much simpler alternative to staandard Rayleigh-Schroedinger perturbation theory were investigated. Finally, the shifted 1/N expansion for the energy eigenstates in non-relativistic quantum mechanics was developed and studied. The results provide an accurate, rapidly convergent, powerful new way of handling any spherically symmetric potential. DOE

N85-24923# California Univ., Livermore. Lawrence Livermore Lab.
WORKSHOP REPORT ON NEW DIRECTIONS IN SOFT X-RAY PHOTOABSORPTION
Roger Bartlett (LASL, N. Mex.), Nancy Kerr DelGrande, ed., Ingolf Lindau (Stanford Univ., Calif.), Steven Manson (Georgia State Univ.), A. L. Merts (LASL, N. Mex.), and Richard Pratt (Pittsburgh Univ.) 17 Sep. 1984 71 p Workshop held in Pacific Grove, Calif., 8-11 Apr. 1984
(Contract W-7405-eng-48)
(DE85-006150; CONF-8404181-2) Avail: NTIS HC A04/MF A01

The thrust of the Workshop was to understand total photoabsorption cross sections for isolated neutral atoms, excited atoms and atoms in environments; focusing on the range 100 eV to 10 keV. Related phenomena, such as photoelectron spectroscopy, were included insofar as they elucidated photoabsorption cross sections. The intent of the Workshop was to clarify the current state of theory and experiment and to identify the opportunities which new theoretical methods and experimental facilities could be expected to provide. The understanding of photoabsorption (which requires experimental photoabsorption data) is a key to understanding the properties and behavior of atoms, molecules and solids. The rapid growth of X-ray optics (which requires using optical constants to design instrumentation) is likely to expand our horizons in many areas of physics. E.R.

N85-24924# Union Coll., Schenectady, N.Y. Dept. of Physics.
INFLUENCES OF THERMAL SPIKES IN ION BEAM MIXING
David Peak and R. S. Averback (Argonne National Lab., Ill.) Oct. 1984 18 p refs Presented at the Intern. Conf. on Ion Beam Modification of Mater., Ithaca, N.Y., 16 Jul. 1984 Submitted for publication
(Contract W-31-109-eng-38)
(DE85-006130; CONF-840760-19) Avail: NTIS HC A02/MF A01

Guided by the results of molecular dynamics simulations, a thermal spike model was developed for the relaxation of collision cascades in which the hot zone has mobile, reacting defects and cools by thermal diffusion. Marker atoms within such spikes are taken to migrate by radiation enhanced diffusion which is governed by the locally transient temperatures and defect concentrations. The atomic mixing associated with such motions is examined, on the basis of the model, for a variety of ion target systems. The dependences of spike mixing on diffusion mechanism, irradiation ion and energy, and sample temperature are discussed. DOE

N85-24925# Oak Ridge National Lab., Tenn.
INDIRECT PROCESSES IN ELECTRON-IMPACT IONIZATION OF MULTIPLY-CHARGED IONS
D. C. Gregory 1984 19 p refs Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12-14 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005237; CONF-841117-39) Avail: NTIS HC A02/MF A01

Recent research efforts have assembled a steadily increasing array of measurements and calculations of electron impact ionization of multiply charged ions. Significant disagreement is often found, however, between experimental results and theory due to the influence of a number of indirect processes observed in the experiments but not included in the calculations. Some of the most important of these indirect ionization processes are described and examples are discussed. New data for electron impact single ionization of Kr(2+) are presented in the energy range from below threshold (36 eV) to 1500 eV, and compared to related measurements and to theory. DOE

N85-24926# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS SCIENCE, NUMBER 11, SUMMER-FALL, 1984
Necia Grant Cooper, ed. 1984 188 p refs
(Contract W-7405-eng-36)
(DE85-004634; LA-UR-84-2100) Avail: NTIS HC A09/MF A01

Scale and dimension, from animals to quarks; particle physics and the standard model; lecture notes, from simple field theories to the standard model; toward a unified theory, an essay on the role of supergravity in the search for unification; symmetry at 100 GeV; the family problem; experiments to test unification schemes; the march toward higher energies; and science underground, the search for rare events are contained. DOE

N85-24927# Texas A&M Univ., College Station. Dept. of Chemistry.
X-RAY EMISSION IN HEAVY ION COLLISIONS Final Report
R. L. Watson 10 Dec. 1984 11 p
(Contract DE-AS05-78ER-06036)
(DE85-006350; DOE/ER-06036/T3) Avail: NTIS HC A02/MF A01

A detailed accounting of the yearly activities of the research program entitled X-ray emission in heavy ion collisions may be found in the annual progress reports submitted in accordance with the terms of the contract. The principal goals of the program to be summarized herein were: (1) to delineate the mechanisms whereby highly ionized atoms in the condensed phase deexcite and return to charge neutrality, (2) to investigate the charge quenching processes acting to reduce the charge states of highly ionized projectiles, and (3) to attain a better understanding of the interactions occurring between highly charged ions and solid surfaces. These projects all relate to problems associated with the ultimate application of controlled thermonuclear reactions as a practical energy source. DOE

N85-24928# California Univ., Berkeley. Lawrence Berkeley Lab.
RESONANCES IN PHOTON-PHOTON SCATTERING
M. S. Chanowitz Nov. 1984 28 p refs Presented at the 6th Intern. Workshop on Photon-Photon Collisions, Lake Tahoe, Calif., 9-13 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-004607; LBL-18701; CONF-8409194-1) Avail: NTIS HC A03/MF A01

A quantity called stickiness is introduced which should be largest for J not equal to 0 glueballs and can be measured in two photon scattering and radiative J/psi decay. An argument is reviewed suggesting that light J = 0 glueballs may have large couplings to two photons. The analysis of radiative decays of eta and eta prime is reviewed and a plea made to desist from false claims that they are related to GAMMA((PI)(0) (YIELDS) (GAMMA) (GAMMA)) by SU(3) symmetry. It is shown that two photon studies can refute the difficult-to-refute hypothesis that xi(2220) or zeta (8320) are Higgs bosons. A gallery of rogue resonances and resonance candidates is presented which would usefully be studied in (GAMMA)(GAMMA) scattering, including especially the low mass dipion. DOE

N85-24929# Paris-Sud Univ., Orsay (France).
SLOWING DOWN OF CHARGED PARTICLES BY THE BOUND ELECTRONS IN A PLASMA Ph.D. Thesis [RALENTISSEMENT DE PARTICULES CHARGEES PAR LES ELECTRONS LIES D'UN PLASMA]
X. Garbet Dec. 1984 154 p refs In FRENCH; ENGLISH summary
(LP-209) Avail: NTIS HC A08/MF A01

The temperature and density effects for bound electrons stopping power in a plasma are examined within Born approximation. The mean excitation energy is calculated with a variational method, and an approximation method. It is shown that the first order subshell correction is the same for bound and free electrons. A sudden impulse approximation is worked out to compute the stopping power behavior at low projectile velocity. The numerical calculations are performed with the aid of an average atom model. Author (ESA)

N85-24930# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ELEMENTARY PROCESSES OF ELECTRONICALLY EXCITED PARTICLES. PART 5: DEACTIVATION OF CHF (A1a' (O, V'2, O) AFTER EXCITATION BY A PULSED DYE LASER [ELEMENTARPROZESSE ELEKTRONISCH ANGEREGTER TEILCHN 5. VIBRONISCHE DESAKTIVIERUNG NON CHF (A1A' (O, V'2, O) NACH ANREGUNG MIT EINEM GEPULSTEN FARBSTOFFLASER]
G. Dornhoefer and W. Hack Aug. 1984 69 p refs In GERMAN (MPIS-13/1984; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, Federal Republic of West Germany DM 13,20

The dynamics of CHF in its A1A'-state were investigated in a selectively excited vibrational state. Laser induced fluorescence (LIF) was used quantitatively in the presence of various quenching gases. Single vibrational level excitation was obtained with a tunable pulsed dye laser. The CHF ground state was obtained in IR multiphoton dissociation of CH2F2 with R20-line at 9.27 micrometer. The lowest detectable CHF-concentration with LIF is 2 times 10 to the power-13 mol/cucm. The observation of the time-resolved fluorescence from the levels V'2 = 4 and 5 in CHF leads to collisionless lifetimes of 1.65 and 1.5 microsec respectively. Measured vibrational band intensities (Franck-Condon factors) from spectrally resolved fluorescence spectra are given for all transitions from the upper state. All quenching-rate constants are close to the gas-kinetic collision number. The rates do not show systematic increase with increasing vibrational quantum number; the absolute value depends on the intramolecular properties of CHF rather than on quencher properties.
Author (ESA)

N85-24931# Rome Univ. (Italy). Dipt. di Fisica.
O. F. MOSSOTTI AND THE PHYSICS OF MOLECULES [O. F. MOSOTTI E LA FISICA MOLECOLARE]
M. Grilli and V. Nesi 24 Feb. 1984 47 p refs In ITALIAN (NOTA-INTERNA-822) Avail: NTIS HC A03/MF A01

The contributions of Mossotti (1813-1862) to the development of molecular theories in physics are reviewed, including the discussion of his work concerning crystallography, heat transfer, optics, electricity and chemistry. Author (ESA)

N85-23908# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
MEASUREMENTS OF INTEGRAL YIELDS OF CHARGED SECONDARYBAD CAPS LANGUAGE[y] PARTICLES USING NEUTRAL BEAMS SIMULATING A COMETARY FLY-BY
R. Schmidt and H. Arends *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 15-19 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-23910# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
IMPACT IONIZATION FROM GOLD, ALUMINUM AND PCB-Z
E. Gruen *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 39-41 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-24932# RE/SPEC, Inc., Rapid City, S. Dak.
APPLICATION OF FAR-FIELD MODELS TO THE DISPOSAL OF NUCLEAR WASTE IN GEOLOGIC FORMATIONS
T. Brandshaug and D. Svalstad Dec. 1984 12 p refs Presented at Western States Mining Exposition, Reno, Nev., 7 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE85-005489; SAND-84-7211C; CONF-840854-1) Avail: NTIS HC A02/MF A01

Far-Field (FF) models, and their application to the study of geologic disposal of nuclear waste are presented. Far-field models are utilized to provide information about rock behavior on a regional scale due to the presence of a repository. The far-field models describe the physical phenomena in terms of a mathematical boundary value problem. The model predicts detail of these phenomena within a geometric boundary extending vertically down from the ground surface several thousand meters below the repository horizon, and laterally out several thousand meters beyond the edges of the repository. The FF models that are discussed utilize a closed form solution to solve the problem of conductive heat transfer associated with the heat produced by the radioactive waste at a decreasing rate, and the finite element method to predict the thermally induced displacements and associated stresses in the far-field rock. DOE

N85-24933# Los Alamos Scientific Lab., N. Mex.
THEORETICAL ASPECTS OF THE NUCLEON-NUCLEON WORKSHOP
R. R. Silbar 1984 11 p refs Presented at 6th Intern. Symp. on High Energy Phys., Marseille
(Contract W-7405-eng-36)
(DE85-003740; LA-UR-84-3592; CONF-8409162-10) Avail: NTIS HC A02/MF A01

Topics covered include the visibility of quark signals, dibaryons, the model dependence of predicted NN inelasticities, and a review of how well present conventional models compare with a rapidly expanding database. The general conclusion is that there is so far no clear evidence in the NN system at intermediate energies for unconventional dibaryon resonances. Short remarks are also made concerning one theoretical contribution on elastic scattering and on new experimental results for deuteron photo-disintegration and pion-nucleon charge exchange. DOE

N85-24934# Department of Energy, Washington, D. C. High Energy Physics Div.
SUMMARIES OF FY 1984 RESEARCH IN HIGH ENERGY PHYSICS
Dec. 1984 309 p refs
(DE85-005641; DOE/ER-0210) Avail: NTIS HC A14/MF A01

The High Energy Physics Program primarily utilizes four major US high energy accelerator facilities and over 90 universities under contract to do experimental and theoretical investigations on the properties, structure, and transformation of matter and energy in their most basic forms. The scope and nature of high energy physics research presently funded by the US Department of Energy is compiled. The areas covered include: (1) conception, design, construction, and operation of particle accelerators; (2) experimental research using the accelerators and ancillary equipment; (3) theoretical research; and (4) research and development programs to advance accelerator technology, particle detector systems, and data analysis capabilities. Major concepts and experimental facts in high energy physics have recently been discovered which have the promise of unifying the fundamental forces and of understanding the basic nature of matter and energy. DOE

74 OPTICS

Includes light phenomena.

N85-24935# Naval Research Lab., Washington, D. C.
APPLICATIONS OF COMPOUND EYE CONFIGURATIONS TO SMART SENSOR DESIGN Final Report, Sep. - Dec. 1983
W. H. Carter 26 Feb. 1985 23 p
(AD-A150731; NRL-MR-5480) Avail: NTIS HC A02/MF A01

CSCL 17/8

The application of compound eyes to the design of smart sensors is reviewed. Special attention is given to features of this class of eyes which might be of particular advantage in these applications. It was found that the compound eyes are much more compact than the human eye. It appears that apposition compound eyes are not very promising for application to smart sensors because of their inherent low resolution and sensitivity. The superposition compound eyes might be of more interest if high quality gradient index lens arrays could be obtained in sufficient quality. It does not appear that this is now the case. Some features of insect eyes such as the corneal nipples, and tracheole layer might definitely be of some value in systems design. The present state of knowledge of compound eyes is far from complete. The true functional operation of the clear zone eyes is not a matter of total agreement between all biologists. Several specific suggestions are made for the application of features from compound eyes to smart sensor systems. GRA

N85-24936# Florida Univ., Gainesville. Dept. of Nuclear Engineering Sciences.

FEASIBILITY OF OPTICAL INSTRUMENTS BASED ON MULTIAPERTURE OPTICS Final Report, 15 Jun. 1983 - 30 Sep. 1984

J. D. Cox, R. T. Schneider, and J. H. Jamed 16 Oct. 1984 18 p
(Grant AF-AFOSR-0240-83)
(AD-A150868; AFOSR-85-0111TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

This paper deals with a recognition system specialized for low pixel numbers. It is assumed that the image consists of 15 x 15 pixels. Using such a low pixel number, the object is distorted beyond recognition if its straight edges are not lined up with the grid. This is especially important if the previously described method based on interpretation of each pixel row as a binary number is used. Therefore, it is shown that a given image of a randomly oriented object can be rotated by a subroutine requiring only little processing time. The resultant image deviates only to a minute degree from the image which would have been observed with its straight edges lined up with the pixel grid. GRA

N85-24937# TRW Defense Systems Group, McLean, Va. Systems Engineering and Applications Div.

RESEARCH STUDY OF FIBER-OPTIC INTERFEROMETRY AT VERY LOW FREQUENCIES

R. B. Edwards 30 Jun. 1984 101 p
(Contract N00019-83-C-0382)
(AD-A150906; TRW-43407.000) Avail: NTIS HC A06/MF A01 CSCL 20/6

A comprehensive review of fiber-optic interferometry shows that frequency-dependent phenomena affecting fiber-optic interferometric electromagnetic sensors at very low frequencies have been neither adequately understood nor quantitatively described. In addition to the electro-optical and magneto-strictive (or electrostrictive) factors that intrinsically limit transduction, other interactive mechanisms such as skin-depth and mechanical loading are commonly supposed to affect the detection sensitivity of the interferometric sensor. This research study of fiber-optic interferometry consists of the following: a review of fiber-optic interferometry, analyses aimed at understanding the mechanisms and quantifying where possible, their effects, and an investigation of means to reduce their impact on the performance of practical sensor implementations. Additional experimental studies have been planned in an attempt to address these interactive mechanisms, their effects and methods of mitigating them. The experimental studies have been performed on a best efforts basis due to cost and schedule constraints. Author (GRA)

N85-24938# Colorado School of Mines, Golden. Center for Wave Phenomena.

A FAST RAY TRACING ROUTINE FOR LATERALLY INHOMOGENEOUS MEDIA

P. Docherty 29 Jan. 1985 38 p
(Contract N00014-84-K-0049)
(AD-A150984; CWP-018) Avail: NTIS HC A03/MF A01 CSCL 20/6

This document describes the use of continuation or homotopy procedures in an efficient algorithm for the calculation of raypaths from points within a region at depth to receivers on the surface. Polynomials define the interfaces in a two-dimensional piecewise constant velocity medium. Starting with horizontal layering only, the interfaces are gradually deformed until the desired Earth model is achieved. At each deformation step the ray equations determined by Fermat's Principle are solved using Newton's method and the ray from the first source position to a receiver vertically above it is found. Next the author employs source continuation, moving the source on a grid within the region of interest. At each source position he finds the rays to all receivers using continuation in receiver location. Knowing the raypaths, it is straightforward to construct a table of traveltimes. These traveltimes alone serve to position reflectors in the subsurface. Two examples of migration and indicate possible applications to forward modeling are given. Author (GRA)

N85-24939# Texas Technological Univ., Lubbock. Optical Systems Lab.

SPACE-VARIANT OPTICAL SYSTEMS Final Technical Report, 30 Sep. 1979 - 30 Sep. 1984

J. F. Walkup and T. F. Krile 30 Nov. 1984 23 p
(Grant AF-AFOSR-0076-79)
(AD-A151032; AFOSR-85-0090TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Both experimental and analytical investigations of 1-D and 2-D, coherent and incoherent space-variant optical processors have been conducted. The investigations included: (1) continuation of a previous work on multiplexed holograms with phase-coded reference beams, (2) construction of a computer-controlled laser plotter, (3) design of incoherent processors which use color as an extra parameter, (4) applications of acousto-optical modulators and time-integrating detectors to space-variant processors, (5) initiation of piecewise-isoplanatic model investigations, and (6) initiation of studies on the use of space-variant systems for binary numerical optical computing. GRA

N85-24940# Stanford Linear Accelerator Center, Calif.

FIRST- AND SECOND-ORDER CHARGED PARTICLE OPTICS

K. L. Brown and R. V. Servranckx Jul. 1984 39 p refs Presented at 3rd Ann. Summer School on High Energy Accelerators, Upton, N.Y., 6 Jul. 1983 Prepared in cooperation with Saskatchewan Univ., Saskatoon
(Contract DE-AC03-76SF-00515)
(DE85-006310; SU-SLAC-PUB-3381; CONF-8307126-3) Avail: NTIS HC A03/MF A01

Since the invention of the alternating gradient principle there was a rapid evolution of the mathematics and physics techniques applicable to charged particle optics. A differential equation and a matrix algebra formalism valid to second-order to present the basic principles governing the design of charged particle beam transport systems are derived. A notation first introduced by John Streib is used to convey the essential principles dictating the design of such beam transport systems. For example the momentum dispersion, the momentum resolution, and all second-order aberrations are expressed as simple integrals of the first-order trajectories (matrix elements) and of the magnetic field parameters (multipole components) characterizing the system. DOE

N85-24941# California Univ., Livermore. Lawrence Livermore Lab.

EXPERIMENTAL REPORT ON A FIBER OPTIC LIGHT GUIDE MADE BY GALILEO ELECTRO-OPTICS CORPORATION

D. G. Stearns 4 Oct. 1984 8 p refs
(Contract W-7405-eng-48)
(DE85-006161; UCRL-15643) Avail: NTIS HC A02/MF A01

The investigation of damage induced by high irradiance in a fiber optic light guide made by Galileo Electro-Optics Corp. is reported. The specific intent was to test the light guide under conditions of irradiance sufficient to saturate a GaAs:Cr photocon-

ductive switch (1.5mm gap in a 50 ohm transmission line). The light guide was able to operate for 2E4 light pulses without any apparent deterioration. DOE

N85-24942# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Visuologie.
RETROREFLECTIVE ARMBANDS: INFLUENCES OF WEARING MODE, AGING AND OTHER FACTORS ON THE VISIBILITY DISTANCE
P. Padmos and J. W. A. M. Alferdinck Sep. 1984 24 p refs In DUTCH; ENGLISH summary
(Contract A84/KL/018)
(IZF-1984-28; TDCK-79661) Avail: NTIS HC A02/MF A01

Reflective properties of bands of various types of retroreflective material were measured, in new and used condition. The visibility distances from a moving car at night were determined for bands, including the waffle reflexite type, for favorable and unfavorable conditions. Wearing the band around the ankle provides better visibility than wearing it around the upper arm. For less favorable observation conditions, the waffle reflexite band, even when new, provides considerably smaller visibility distance than required.
Author (ESA)

N85-24086# Joint Publications Research Service, Arlington, Va.
OPTOACOUSTIC RECEIVER WITH SEMICONDUCTOR-TYPE RADIATOR AND PHOTODETECTOR Abstract Only
V. P. Kolonistov and M. V. Robachevskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 57 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 56 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24087# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF SENSITIVITY OF SHADOWGRAPHIC INSTRUMENTS WITH SPHERICAL AUTOCOLLIMATING MIRROR Abstract Only
A. S. Avramenko, E. Yu. Durovich, and B. V. Naumov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 57-58 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 9, Sep. 1983 p 40-43 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24088# Joint Publications Research Service, Arlington, Va.
USE OF FOCONS IN COMBINATION WITH BRIGHTNESS AMPLIFIERS Abstract Only
S. P. Bondarev and N. P. Kupreychik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 58-59 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 59 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24090# Joint Publications Research Service, Arlington, Va.
DETERMINING OPTIMUM SERVICE CONDITIONS FOR CONCENTRATOR MIRRORS BY METHODS OF MATHEMATICALLY PLANNED EXPERIMENT Abstract Only
A. Ismanzhanov, Ts. M. Altman, R. A. Zakhidov, and L. A. Dubrovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 60 Transl. into ENGLISH from Geliotekhn. (Tashkent), no. 4, Apr. 1984 p 45-49 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24097# Joint Publications Research Service, Arlington, Va.
SCHEME FOR MEASURING SPECULAR REFLECTION COEFFICIENT AT 10.6 MICRONS WAVELENGTH WITH ZIGZAG-PATH CELL AND INTEGRATING SPHERE Abstract Only
T. A. Zhevlakova and S. S. Sementsov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 64-65 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 31-32 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24098# Joint Publications Research Service, Arlington, Va.
COLOR-SELECTIVE COATING FOR VIEWFINDER IN OPTICAL INSTRUMENTS Abstract Only
B. D. Gorelik, D. Ye. Yefremov, and A. P. Lavrishchev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 65-66 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 28-30 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24099# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF PROPERTIES OF OPTICAL CAVITY ON MISALIGNMENT Abstract Only
A. L. Levit and V. M. Ovchinnikov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 66 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 17-18 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24100# Joint Publications Research Service, Arlington, Va.
ABERRATION CHARACTERISTICS OF PLANE-PARALLEL COMPENSATOR PLATE Abstract Only
I. E. Komarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 66-67 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 13-16 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24101# Joint Publications Research Service, Arlington, Va.
ERROR OF DISTANCE MEASUREMENT BY PHASE-TYPE OPTICAL RANGE FINDERS WITH PHOTORECEIVERS OF VARIOUS TYPES Abstract Only
Yu. P. Yegorov and B. L. Pivovarov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 67 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Tashkent), no. 7, Jul. 1983 p 3-4 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24129# Joint Publications Research Service, Arlington, Va.
RESISTANCE OF OPTICAL COATINGS TO ALKALI SOLUTIONS AND SEA WATER Abstract Only
A. Ya. Kuznetsov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 85 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 59-61 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24136# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ROUGHNESS ANALYSIS OF TREATED SURFACES WITH HIGHER-CLASS FINISH BY METHODS OF X-RAY REFLECTOMETRY Abstract Only
V. M. Sinayskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 90 Transl. into ENGLISH from Izmeritel. Tekhn. (Moscow), no. 6, Jun. 1983 p 27-29 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24482# Joint Publications Research Service, Arlington, Va.
VISIBILITY OF SMALL OBJECTS IN TURBID ATMOSPHERE Abstract Only
A. S. Drofa *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-004) 13 Mar. 1985 p 51 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmos. i Okeana (USSR), v. 20, no. 10, Oct. 1984 p 939-946 Original language document announced as 85A-15395 (For primary document see N85-24424 14-42)
Avail: NTIS HC A05/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-24943# Argonne National Lab., Ill.
EXPERIMENTAL FACILITY FOR STUDYING MHD EFFECTS IN

LIQUID METAL COOLED BLANKETS
C. B. Reed, B. F. Picologlou, and P. V. Dauzvardis 1985 3 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-000583; CONF-850310-4) Avail: NTIS HC A02/MF A01

The capabilities of a facility, brought into service to collect data on magnetohydrodynamic (MHD) effects, pertinent to liquid metal cooled fusion reactor blankets, are presented. The facility, design to extend significantly the existing data base on liquid metal MHD, employs eutectic NaK as the working fluid in a room temperature closed loop. The instrumentation system is capable of collecting detailed data on pressure, voltage, and velocity distributions at any axial position within the base of a 2 Tesla conventional magnet. The axial magnetic field distribution can be uniform or varying with either rapid or slow spatial variations. DOE

N85-24944# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
RESEARCH ON THERMIONIC PLASMAS Final Report, 15 Jan. 1983 - 30 Jun. 1984
G. L. Main and S. H. Lam 13 Jun. 1984 157 p
(Grant AF-AFOSR-0048-83)
(AD-A150663; MAE-1662; AFOSR-85-0087TR) Avail: NTIS HC A08/MF A01 CSCL 20/3

Emitter sheath phenomena are important in thermionic energy conventors because the emitter sheath forms the boundary conditions for the plasma in the gap and controls both the ion loss rate and the loss rate of hot (3000 K) plasma electrons to the emitter. This thesis examines three expected emitter sheath phenomena and their effects on conventor performance: (1) reflection of ions coming from the plasma; (2) ions trapped in the double emitter sheath; and (3) surface emission ions. Inclusion of these 3 phenomena combined with elimination of previous sheath approximations requires careful analysis and calculation of the sheath structure. It is shown that the 'Bohm' matching condition must be generalized to insure that self-consistency prevails throughout the entire sheath and not just at the plasma-sheath interface. It is also shown that plasma ion distribution coming into that sheath must have its low energy ions cut off to produce a self-consistent collisionless sheath, and that each of these emitter sheath phenomena reduce the normalized (by plasma density) net loss rate to the emitter. Each of these phenomena also raises the normalized plasma density adjacent to the emitter. The higher plasma density at the emitter causes a greater increase in the loss of hot plasma electron energy to the emitter than the corresponding decrease in the loss of ionization energy (carried by the ions) to the emitter. Therefore these emitter sheath phenomena increase arcdrop. Within the limitations of the current thermionic conventor formulation, all three of these phenomena (which become significant at low currents) steepen the current-voltage characteristic. GRA

N85-24945*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE DOWNSHIFT OF ELECTRON PLASMA OSCILLATIONS IN THE ELECTRON FORESHOCK REGION Progress Report
S. A. Fuselier, D. A. Gurnett, and R. J. Fitzenreiter 10 Oct. 1984 54 p
(Contract NAS5-26819; Grant NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-175633; NAS 1.26:175633; AD-A150752; U-of-Iowa-84-21) Avail: NTIS HC A04/MF A01 CSCL 20I

Electron plasma oscillations in the Earth's electron foreshock region are observed to shift above and below the local electron plasma frequency. As plasma oscillations shift downward from the plasma frequency, their bandwidth increases and their wavelength decreases. Observations of plasma oscillations well below the plasma frequency are correlated with times when ISEE-1 is far downstream of the electron foreshock boundary. Although wavelengths of plasma oscillations below the plasma frequency satisfy k(lambda)De approximately = 1, the Doppler-shift due to the motion of the solar wind is not sufficient to produce the observed frequency shifts. A beam-plasma interaction with beam velocities on the order of the electron thermal velocity is suggested as an explanation for plasma oscillations above and below the plasma frequency. Frequency, bandwidth, and wavelength changes predicted from the beam-plasma interaction are in good agreement with the observed characteristics of plasma oscillations in the foreshock region. GRA

N85-24946# United Technologies Research Center, East Hartford, Conn.
THEORETICAL STUDIES OF KINETIC MECHANISMS OF NEGATIVE ION FORMATION IN PLASMAS Annual Technical Report, 1 Jun. 1983 - 1 Jun. 1984
H. H. Michels and R. H. Hobbs Jul. 1984 31 p
(Contract F49620-83-C-0094)
(AD-A150820; UTRC/R84-926533; AFOSR-85-0125TR) Avail: NTIS HC A03/MF A01 CSCL 20/9

This technical program constitutes a theoretical research investigation of the kinetic mechanisms of negative ion formation in plasmas. This study was directed toward elucidating the mechanisms of the most important volume-dependent reactions that occur in hydrogen-ion H- (D-) source devices, primarily of the Belchenko-Dimov-Dudnikov (BDD) type. The primary goal of this research program was to identify the most important reactions leading to H- (D-) production or destruction and to estimate these reaction rates as a function of system parameters such as density, composition and temperature. A further goal was to explore new chemical sources for the production of light mass negative atomic ions. The results of this program furnish data and provide direction for more detailed investigations into the kinetics of both gas phase and gas-surface reaction rates of importance in ion source devices and provide input for reliable modeling of such systems. This investigation was carried out using quantum mechanical methods. Both ab initio and density functional approaches were employed in these studies. GRA

N85-24947# AMAF Industries, Columbia, Md.
EXPERIMENTAL INVESTIGATION OF NEUTRAL PLASMA BEAM PROPAGATION ACROSS A MAGNETIC FIELD Final Report
C. Spight and R. W. Miller 23 Sep. 1984 79 p
(Contract F49620-83-C-0091)
(AD-A150944; Rept-8409-X1300-200; AFOSR-85-0097TR) Avail: NTIS HC A05/MF A01 CSCL 20/9

The conversion, described herein, of a pre-existing Hypervelocity Plasma Generator Facility to operate in a regime of importance to particle beam research has been completed. The facility is now capable of producing a plasma flow-magnetic field environment that in a scaled manner simulates the exoatmospheric propagation of a plasmoid across the geomagnetic field. A full set of flow and field diagnostics have been implemented and calibrated. It includes magnetic field probes for the slowly varying transverse background and the fast varying motionally induced fields, a laser schliren system for monitoring density gradient structure of the beam and time-of-flight fast photodiode probes for beam velocity measurements. Port access is available for monitoring directly electrostatic or electromagnetic fields associated with beam propagation. In tandem with experimental activity a theoretical analysis effort has been initiated, an interaction with theoreticians at Los Alamos Scientific Laboratory, which intends a significant contribution to the stability analysis of a bounded plasma beam which can exhibit polarization and/or diamagnetic effects. No satisfactory theory or numerical simulations are currently available for that intrinsically three-dimensional dynamics. GRA

N85-24948# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
SPATIAL RESOLUTION OF SMALL PARTICLES IN SILANE DISCHARGE Interim Report
K. G. Spears and R. M. Roth 18 Feb. 1985 7 p
(Contract N00014-79-C-0622)
(AD-A150953; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

A capacitively coupled, RF glow discharge of silane in argon was a studied with laser light scattering to determine the spatial concentration of small particles. Multi-wavelength scattering profiles have been obtained and are being analyzed to obtain size distributions as a function of spatial location. Very sharply defined particle zones can be found under some plasma conditions that are spatially related to the silicon atom profiles. We will report our results and attempt to qualitatively describe how these zones relate to plasma chemistry and film deposition processes. GRA

N85-24949# Naval Research Lab., Washington, D. C.
CURRENT DISTRIBUTION IN A PLASMA EROSION OPENING SWITCH Memorandum Report, Jan. - Dec. 1983
B. V. Weber, R. J. Commisso, R. A. Meger, J. M. Neri, and W. F. Oliphant 27 Feb. 1985 17 p
(AD-A150987; NRL-MR-5515) Avail: NTIS HC A02/MF A01 CSCL 20/9

The current distribution in a plasma erosion opening switch is determined from magnetic field probe data. During the closed state of the switch the current channel broadens rapidly. The width of the current channel is consistent with a bipolar current density limit imposed by the ion flux to the cathode. The effective resistivity of the current channel is consistent with a bipolar current density limit imposed by the ion flux to the cathode. The effective resistivity of the current channel is anomalously large. Current is diverted to the load when a gap opens near the cathode side of the switch. The observed gap opening can be explained by erosion of the plasma. Magnetic pressure is insufficent to open the gap.
Author (GRA)

N85-24950# Oak Ridge National Lab., Tenn.
SPECIAL PURPOSE MATERIALS FOR FUSION APPLICATION
J. L. Scott, F. W. Clinard, Jr. (LASL), and F. W. Wiffen 1984 27 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3 Dec. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005346; CONF-841246-8) Avail: NTIS HC A03/MF A01

Materials for superconducting magnets and ceramics were studied. For the former application copper-stabilized Nb3Sn (Ti) insulated with polyimides will meet the general requirements, so that testing of prototype components is the priority task. Ceramics are required for several critical components of fusion reactors either as dielectrics or as a structural material. Components near the first wall will receive exposures of 5 to 20 MW.year/m(2). Other ceramic applications are well behind the first wall, with lower damage levels. Most insulators operate near room temperature, but ceramic blanket structures may operate up to 1000 C. Because of a meager data base, one cannot identify optimum ceramics for structural application; but MgAl2O4 is an attractive dielectric material. DOE

N85-24951# Oak Ridge National Lab., Tenn. Fusion Energy Div.
NONINDUCTIVE CURRENT DRIVE IN TOKAMAKS
N. A. Uckan Jan. 1985 198 p refs
(Contract DE-AC05-84OR-21400)
(DE85-005427; ORNL/TM-9296) Avail: NTIS HC A09/MF A01

Various current drive mechanisms may be grouped into four classes: (1) injection of energetic particle beams; (2) launching of RF waves; (3) hybrid schemes; which are combinations of various RF schemes (RF plus beams, rf and/or beam plus ohmic heating, etc.); and (4) other schemes, some of which are specific to reactor plasma conditions requiring the presence of alpha particle or intense synchrotron radiation. Particle injection schemes include current drive by neutral beams and relativistic electron beams. The RF schemes include current drive by the lower hybrid (LH) waves, the electron waves, the waves in the ion cyclotron range of frequencies, etc. Only a few of these approaches, however, have been tested experimentally, with the broadest data base available for LH waves. Included are: (1) efficiency criteria for current drive, (2) current drive by neutral beam injection, (3) LHG current drive, (4) electron cyclotron current drive, (5) current drive by ion cyclotron waves - minority species heating, and (6) current drive by other schemes (such as hybrids and low frequency waves). DOE

N85-24952# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
ICRF ANTENNA COUPLING THEORY FOR A CYLINDRICALLY STRATIFIED PLASMA
Brian McVey Jul. 1984 111 p refs
(Contract DE-AC02-78ET-51013)
(DE85-004960; DOE/ET-51013/129; PFC/RR-84-12) Avail: NTIS HC A06/MF A01

Antenna coupling to a cylindrical plasma is examined for the ion cyclotron range of frequencies (ICRF). A variety of antenna configurations are modelled such as a partial turn loop, Nagoya coils, an aperture antenna, and arrays of coils. A procedure that utilizes the induction theorem is presented which replaces a general coil configuration with an equivalent representation in terms of sinusoidal current sheets. This transformation reduces the three dimensional antenna boundary value problem to that of one dimension (r, the radial coordinate) with the spatial variation in the other directions represented by complex exponentials (exp (in phi + ik/sub z/z)). As constructed, the transformation is directly applicable to axisymmetric geometries where the plasma parameters are only functions of radius. The radial variation of the plasma parameters such as the local density and temperatures are approximated by a stratified model. As the number of strata are increased, the step wise model is shown to converge to the continuous case. The plasma response is modelled by a local equivalent dielectric tensor. In the context of this model antenna plasma coupling characteristics are compared for the various ICRF antennas. DOE

N85-24953# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
ANTENA USER GUIDE
Brian McVey Jul. 1984 31 p refs
(Contract DE-AC02-78ET-51013)
(DE85-004961; DOE/ET-51013/130; PFC/RR-84-13) Avail: NTIS HC A03/MF A01

Use of the computer code ANTENA is described. The code calculates the vacuum fields and the linear self-consistent plasma fields for a variety of ICRF antenna configurations. DOE

N85-24954# Argonne National Lab., Ill.
MAGNETO-FLUID-DYNAMIC ISSUES FOR FUSION FIRST WALL AND BLANKET SYSTEMS
B. F. Picologlou, C. B. Reed, R. Nygren, and J. Roberts 1984 27 p refs Presented at the 4th Intern. Seminar on Magnetohydrodynamic Flows and Turbulence, Beer Sheva, Israel, 27 Feb. - 2 Mar. 1984
(Contract W-31-109-eng-38)
(DE85-004022; CONF-8402118-1) Avail: NTIS HC A03/MF A01

Magnetohydrodynamic considerations are shown to be of paramount importance in self-cooled liquid-metal blankets for fusion reactors. Coupling of the stress and MHD pressure drop through the conduit wall thickness is such that, self-cooled liquid-metal blankets without electrical insulators may not be feasible, unless acceptable designs that address satisfactorily MHD-related constraints can be developed. Such an acceptable design, based on current understanding and available analyses and/or experimental data on high Hartmann number, high interaction parameter MHD, is presented. The confidence in the success of the design is directly related to uncertainties on the validity of assumptions necessary to carry out the MHD calculations. Thus, the need for developing analytical tools, supported by experiment is identified and a program for addressing this need is formulated. The experimental facility and the first tests are outlined and the broad goals of companion analytical work are discussed. DOE

N85-24955# Sandia Labs., Albuquerque, N. Mex.
PLASMA-EDGE STUDIES USING CARBON RESISTANCE PROBES
W. R. Wampler 1984 29 p refs Presented at 31 Natl. Vacuum

Symp., Reno, Nev., 3 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE85-005589; SAND-84-1411C; CONF-841218-21) Avail: NTIS HC A03/MF A01

A new plasma edge probe technique, the carbon resistance probe, was developed to obtain this information. This technique utilizes the increase in electrical resistance caused in thin carbon films by energetic particle bombardment to characterize the flux and energy of the incident ions and neutrals. The method is relatively easy to implement and gives data in real time. Energy resolution of low dose exposure was achieved using thin insulating films over the carbon. Calibrations using ion implantation show that the particle energies and fluxes which can be measured with resistance probes are well matched to those typically encountered near the wall in plasma drives. The experimental technique and the model used to relate the measured resistance changes to the energy and flux of particles is described. Experiments are then described in which resistance probes were used to study energetic particles in the PLT and TEXTOR Tokamaks and the TMX-U tandem mirror. Author

N85-24956# Argonne National Lab., Ill.
SELF-SUBSTAINING LOW-Z COATINGS FOR IMPURITY CONTROL. PART 1: GENERAL CONSIDERATIONS
D. M. Gruen and A. R. Krauss 1985 3 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-000427; CONF-850310-9) Avail: NTIS HC A02/MF A01

The candidate materials considered for plasma side use where impurity generation occurs may be divided into low-Z, medium-Z, and high-Z materials. At low plasma edge temperatures (less than or equal to 50 eV), several materials can be used, but high-Z materials such as W are predicted to have the greatest lifetimes. At higher edge temperatures (100 to 300 eV), both medium and high-Z materials are unacceptable due to excessive self sputtering. The permissible plasma side materials are, therefore, confined to those whose self sputtering coefficients do not exceed unity, thus limiting the choice of materials to atomic weights approximately that of SiC unless the edge temperature can be kept below 50 eV. Because candidate heat sink materials are copper or transition metal alloys, most suggestions for plasma side materials in high heat flux applications have involved low-Z coatings such as TiC or Be. DOE

N85-24957# Argonne National Lab., Ill.
MAGNETOHYDRODYNAMIC CONSIDERATIONS FOR THE DESIGN OF SELF-COOLED LIQUID-METAL FUSION REACTOR BLANKETS
Basil F. Picologlou 1985 2 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-000242; CONF-850310-2) Avail: NTIS HC A02/MF A01

During the course of the Blanket Comparison and Selection Study, magnetohydrodynamic effects were shown to prevent not only an efficiency but also a feasibility issue for self cooled liquid metal blankets, especially for Tokamak machines. Based on state of the art MHD analyses and understanding of related phenomena, designs for both mirror and Tokamak machines were developed. Although details of the designs depend on specific reactor parameters, MHD related considerations were the main driver in the development of the designs. These considerations are presented in a unified way, as well as effective strategies to minimize adverse MHD effects so that they can be used as guidelines by others in future design efforts. DOE

N85-24958# Department of Energy, Oak Ridge, Tenn. Office of Scientific and Technical Information.
GLOSSARY OF FUSION ENERGY
M. O. Whitson, ed. Feb. 1985 77 p
(DE84-017180; DOE/TIC-10192-Rev-2) Avail: NTIS HC A05/MF A01

The Glossary of Fusion Energy is an attempt to present a concise, yet comprehensive collection of terms that may be beneficial to scientists and laymen who are directly or tangentially concerned with this burgeoning energy enterprise. Included are definitions of terms in theoretical plasma physics, controlled thermonuclear fusion, and some related physics concepts. Also, short descriptions of some of the major thermonuclear experiments currently under way in the world today are included. DOE

N85-24959# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
STEADY STATE SOLUTION OF THE FOKKER-PLANCK EQUATION COMBINED WITH UNIDIRECTIONAL QUASILINEAR DIFFUSION UNDER DETAILED BALANCE CONDITIONS
K. Hizanidis Apr. 1984 6 p refs Presented at the Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun. - 3 Jul. 1984
(Contract DE-AC02-78FT-51013)
(DE85-004917; DOE/ET-51013/125; PFC/CP-84-11; CONF-840616-23) Avail: NTIS HC A02/MF A01

The relativistic collisional Fokker-Planck equation combined with an externally imposed unidirectional quasilinear (RF) diffusion is solved for arbitrary values of RF diffusion coefficient under conditions of detailed balance of the stationary joint distribution involved. The detailed balance condition imposes a restriction on the functional form of the quasilinear diffusion coefficient which might be associated with the existence of a saturated spectrum of fluctuation in a quasilinearly RF-driven plasma. DOE

N85-23914# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
A MODEL OF PLASMA CLOUD EXPANSION GENERATED BY A DUST PARTICLE IMPACT
H. Maassberg *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 59-63 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-23915# Parker (Lee W.), Inc., Concord, Mass.
GIOTTO PLASMASHEATH AND WAKE CHARGING NEAR HALLEY'S COMET: REVISED PARAMETERS
Lee W. Parker *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 65-69 refs Sponsored by ESA (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-23917# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
ANTICIPATED IMPACT PLASMA PROBLEMS FOR THE COPERNIC-RPA EXPERIMENT IN THE COMETARY ENVIRONMENT
C. dUston and H. Reme *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 81-86 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-23918# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
AN IMPACT PLASMA MONITOR FOR COMETARY MISSIONS
R. Grard *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 87-88 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-23919# Bern Univ. (Switzerland).
PLASMA ENVIRONMENT EFFECTS ON THE GIOTTO ION MASS SPECTROMETER
R. Goldstein *In* ESA The Giotto Spacecraft Impact-Induced Plasma Environ. Sep. 1984 p 89-90 refs (For primary document see N85-23905 14-18)
Avail: NTIS HC A06/MF A01

N85-24190# Joint Publications Research Service, Arlington, Va.
DESIGN, THEORETICAL INNOVATIONS IN TOKAMAKS SYSTEMS

Michal Strida *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-015) 16 Apr. 1985 p 1-3 refs Transl. into ENGLISH from Rude Pravo (Prague), 27 Feb. 1985 p 4 (For primary document see N85-24189 14-31)
Avail: NTIS HC A04/MF A01

N85-24570# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
PLASMA SHEET DYNAMICS DEDUCED FROM ISEE-1 AND -2 ENERGETIC PARTICLE FLUX DATA
J. Dandouras, H. Reme, A. Saint-Marc, J. A. Sauvaud, G. K. Parks (Washington Univ., Seattle), K. A. Anderson (California Univ., Berkeley), and R. P. Lin (California Univ., Berkeley) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 187-191 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24614# Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.
AN EVALUATION OF THE CONTRIBUTIONS OF THE IMS TO EXPERIMENTAL AND THEORETICAL STUDIES OF ULF PLASMA
J. C. Samson *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 471-481 refs Sponsored by Canadian Natural Sciences and Engineering Council (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-24960*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
RADIATION EFFECTS INDUCED IN PIN PHOTODIODES BY 40- AND 85-MeV PROTONS Progress Report, period ending 31 Jan. 1985
J. Becher, R. L. Kernell, and C. S. Reft Apr. 1985 33 p refs
(Grant NsG-5289)
(NASA-CR-175678; NAS 1.26:175678; PTR-85-2) Avail: NTIS HC A03/MF A01 CSCL 20L

PIN photodiodes were bombarded with 40- and 85-MeV protons to a fluence of 1.5 x 10 to the 11th power p/sq cm, and the resulting change in spectral response in the near infrared was determined. The photocurrent, dark current and pulse amplitude were measured as a function of proton fluence. Changes in these three measured properties are discussed in terms of changes in the diode's spectral response, minority carrier diffusion length and depletion width. A simple model of induced radiation effects is presented which is in good agreement with the experimental results. The model assumes that incident protons produce charged defects within the depletion region simulating donor type impurities. Author

N85-24961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MONTE CARLO LATTICE MODELS FOR ADSORBED POLYMER CONFORMATION
Brian S. Good May 1985 12 p refs
(NASA-TP-2453; E-2400; NAS 1.60:2453) Avail: NTIS HC A02/MF A01 CSCL 20L

The adhesion between a polymer film and a metal surface is of great technological interest. However, the prediction of adhesion and wear properties of polymer coated metals is quite difficult because a fundamental understanding of the polymer surface interaction does not yet exist. A computer model for the conformation of a polymer molecule adsorbed on a surface is discussed. The chain conformation is assumed to be described by a partially directed random walk on a three dimensional simple cubic lattice. An attractive surface potential is incorporated into the model through the use of a random walk step probability distribution that is anisotropic in the direction normal to the attractive surface. The effects of variations in potential characteristics are qualitatively included by varying both the degree of anistropy of the step distribution and the range of the anisotropy. Polymer conformation is characterized by the average end to end distance, average radius of gyration, and average number of chain segments adsorbed on the surface. Author

N85-24962# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
AlN INSULATOR FOR 3-5 MIS APPLICATIONS Final Report, 1 Jul. 1982 - 30 Jun. 1984
K. R. Elliott and R. W. Grant Nov. 1984 58 p
(Contract F49620-82-C-0034)
(AD-A150674; AFOSR-85-0091TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

The use of AlN as an insulator for GaAs MIS structures was investigated. The AlN films were prepared by reactive evaporation in an ultra-high vacuum system. Aluminum from a MBE source was reacted with NH3 from an effusion cell on a heated GaAs substrate. Several material preparation variables were investigated which included choice of substrate, substrate surface preparation, growth temperature, Al/NH3 flux ratio, and deposition rate. The optimum AlN film growth parameters in terms of morphology and adhesion were found to involve use of thermally cleaned GaAs substrates, a 500 to 550 C substrate growth temperature, an effective NH3 partial pressure of 0.00005 to 0.00001 Torr at the GaAs surface, and a growth rate of about 100A/min. The AlN prepared in this manner was stoichiometric, polycrystalline, had the hexagonal wurtzite structure, and had no detectable oxygen or carbon contamination as determined by X-ray diffraction, TEM far infrared transmission, and in situ Auger electron spectroscopy. The insulating properties of the AlN/GaAs MIS structures appeared to depend on preparation conditions. It was concluded from several studies that small amounts of undetectable residual oxygen contamination were most likely responsible for the observed variation in AlN conductivity. Complex C-V results were obtained for most AlN/GaAs MIS structures which most likely were influenced by large interface state densities, leakage, and charge storage effects. No definitive correlation between AlN/GaAs preparation parameters and interface state charge densities was obtained. Processes were developed to fabricate both gated diodes and MISFET's from AlN/GaAs samples. GRA

N85-24963# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
TUNNELING IN MAGNETIC SUPERCONDUCTING SYSTEMS Final Report
A. M. Goldman 31 Jan. 1985 44 p
(Contract N00014-78-C-0619)
(AD-A150677) Avail: NTIS HC A03/MF A01 CSCL 20/3

The work described in this report was directed at the study of the interaction between magnetism and superconductivity, a classical problem which is important in establishing a fundamental understanding of both phenomena. This field has attracted increased attention as a consequence of the development of stoichiometric compounds which are superconducting and which contain magnetic ions. The coupling between the conduction electrons and these ions can either be ferromagnetic or antiferromagnetic. The work has had two aspects, the study of thin films of magnetic superconducting compounds using electron tunneling as a tool and the development of techniques for the fabrication of films off the Chevrel phase compounds, which, because of their high critical magnetic fields, are potentially technologically significant materials. The tunneling investigations, in addition to revealing fundamental features of magnetic superconducting materials, have also led to the development of some new techniques for the fabrication of artificiall barrier tunneling junctions and have pointed out unusual possibilities for three-terminal superconducting devices. Author (GRA)

N85-24964# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
PRODUCIBLE ALTERNATIVE TO CdTe FOR EPITAXY (PACE-2) OF LWIR (LONG WAVE INFRARED) HgCdTe Final Technical Report, 1 Aug. 1983 - 31 Jul. 1984
E. R. Gertner Nov. 1984 56 p
(Contract MDA903-83-C-0379; DARPA Order 3704)
(AD-A150678; SC5373.4FTR) Avail: NTIS HC A04/MF A01 CSCL 11/4

This is the final report of the first phase of a program whose objective is the development of a long wave infrared (LWIR) HgCdTe material technology based on heteroepitaxial growth on low cost substrates and to advance this technology to device processing and ultimately focal plane array demonstration. A matrix of five growth techniques and three base substrates (GaAs, Ge and Si) were used to identify the most promising approach. Three epitaxial vapor growth techniques, Laser Assisted Deposition and Annealing (LADA), Molecular Beam Epitaxy (MBE) and Organo-Metallic Vapor Phase Epitaxy (OMVPE) were used to grow epitaxial layers of CdTe on the base substrates. Single crystalline layers of CdTe with near-bulk qualities were obtained on all three base substrates (GaAs, Ge, Si) by all three CdTe vapor growth techniques (LADA, MBE, OM-VPE). OM-VPE growth CdTe on GaAs had the highest crystallinity as determined by X-ray double crystal diffraction. The growth of an additional CdTe layer by Liquid Phase Epitaxy (LPE) improved by the crystallinity of the vapor growth CdTe, but often resulted in higher impurity levels of base substrate elements in the epitaxial CdTe layer due to slight chemical attack of the base substrate during the CdTe LPE cycle. LPE and Isothermal VPE (ISO-VPE) were used for the epitaxial growth of the active HgCdTe layer. Ge, si, PACE-2 Alternative Substrates.
GRA

N85-24965# Illinois Univ., Urbana. Materials Research Lab.
STUDIES OF DEFORMATION IN NIOBIUM BY X-RAY TOPOGRAPHIC METHODS
S. R. Stock, H. Chen, and H. K. Birnbaum Jan. 1985 17 p
(Contract N00014-75-C-1012)
(AD-A150726) Avail: NTIS HC A02/MF A01 CSCL 20/2

We have studied plastic deformation in niobium crystals by a variety of X-ray topographic techniques including: Lang topography, double crystal topography and synchrotron white beam topography. The limitations of these direct methods, which rely on the resolution of individual dislocation segments, are illustrated by our results. An indirect topographic method, contour mapping, is described for use with specimens which cannot be profitably studied with the direct techniques. The positions of equi-inclination contours (analogues to TEM bend contours) are recorded as a function of specimen rotation, allowing measurement of the components of the strain tensor as a function of position on the specimen. Use of monochromatic radiation and of synchrotron white radiation are described and results obtained with contour mapping are summarized.
GRA

N85-24966# Technion - Israel Inst. of Tech., Haifa. Solid State Inst.
LASER ANNEALING OF ION IMPLANTED HgCdTe Final Report, 1 Oct. 1981 - 30 Sep. 1984
R. Kalish 22 Oct. 1984 29 p
(Grant AF-AFOSR-0001-82)
(AD-A150875; AFOSR-85-0116TR) Avail: NTIS HC A03/MF A01 CSCL 13/8

The structural and electrical changes caused by the implantation and annealing of donor and acceptor ions into Hg1-xCdxTe (x=0.2-0.3) were studied by a variety of ion-beam probing (RBS or PIXE combined with channeling) and electrical (C-V, Hall, photodiodes) techniques. Several annealing procedures (Furnace, Q switched Ruby laser and CW CO2 laser) were tried. Best annealing was obtained when the implanted HgCdTe was heated for 0.4 seconds to 380 deg C by exposing it to a flash of photons delivered by a CW CO2 laser. This novel mode of Rapid Thermal Annealing is shown to recover the crystal structure without causing changes in stoichiometry and to electrically activate both donor (B) and acceptor (P) implants. Mesa and planar p on n photodiodes, sensitive to IR radiation (3.5-5 micrometers) were obtained when this annealing procedure was employed to P implanted (200KeV, 2X10 to the 14th power/sq.cm) n-Hg.71Cd.29Te.
GRA

N85-24967# Battelle Pacific Northwest Labs., Richland, Wash.
ELECTRICAL AND THERMAL TRANSPORT PROPERTY STUDIES OF HIGH-TEMPERATURE THERMOELECTRIC MATERIALS Research Progress and Forecast Report, 15 May - 31 Dec. 1984
J. L. Bates 15 Dec. 1984 7 p
(Contract F49620-83-C-0109)
(AD-A150900; AFOSR-85-0138TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

High-temperature materials that exhibit small polaron conduction appear to exhibit the highest figures of merit. A thermoelectric model based on small polaron transport has been developed. The model predicts that broad-band semiconductors with small polarons hopping along inequivalent sites of distorted sublattices can result in increases in both the electrical conductivity and the Seeback coefficient with increasing temperature without significant increases in thermal conductivity. High figures of merit (ZT), greater than 1 at 1000K, that increase with increasing temperatures are predicted. The model is being applied to the divalent metal containing (Y,LA)Cr0(3) systems with an ABO(3) perovskite structure. Transport properties have been determined for various doping elements and for different compositions. These data are being used for the evaluation of this model.
GRA

N85-24968# Massachusetts Inst. of Tech., Cambridge.
INFRARED NONLINEAR PROCESSES IN SEMICONDUCTORS Annual Technical Report, 1 Dec. 1983 - 30 Nov. 1984
P. A. Wolff, R. L. Aggarwal, C. Jagannath, D. M. Larsen, and S. Y. Yuen 4 Jan. 1985 8 p
(Contract F49620-84-C-0010)
(AD-A150966; AFOSR-85-0120TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

Intervalence band relaxation times have been measured, in the picosecond range, in p-type GaAS and Ge. These measured times are in agreement with those calculated for optics phonon mediated processes. An anticrossing, predicted by People and Wolff, has been observed between As donor levels of opposite spin in Ge. A theory has been developed, which, with no adjustable parameters, provides good agreement with experiment.
GRA

N85-24969# Westinghouse Research and Development Center, Pittsburgh, Pa.
INVESTIGATION OF THE MBE GROWTH OF InSb AND NOVEL QUANTUM WELL STRUCTURES Final Report, Oct. 1983 - Oct. 1984
R. F. C. Farrow, A. J. Noreika, T. A. Temofonte, W. J. Takei, and F. A. Shirland 15 Jan. 1985 38 p
(Contract N00014-83-C-0617)
(AD-A151014; Rept-84-9F3-QUADS-R1) Avail: NTIS HC A03/MF A01 CSCL 20/2

Contents: Preparation and Characterization of InSb/CdTe Interfaces; MBE Growth of CdTe on InSb (001) Substrates, MBE Growth of InSb on CdTe Substrates; Photoluminescence of CdTe Films on InSb (001); Magneto-Photoconductivity Studies of MBE-Grown CdTe/InSb Structures; Appendix: Microstructural Studies of CdTe and InSb Films Grown by Molecular Beam Epitaxy.
GRA

N85-24970# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
FERROELECTRIC TUNGSTEN BRONZE BULK CRYSTALS AND EPITAXIAL THIN FILMS FOR ELECTRO-OPTIC DEVICE APPLICATIONS Semiannual Technical Report, 1 Apr. - 30 Sep. 1984
J. R. Oliver Feb. 1985 60 p
(Contract N00014-82-C-2466; DARPA Order 4540)
(AD-A151044; SC5340.8SA; SATR-4) Avail: NTIS HC A04/MF A01 CSCL 20/2

Several doped and updoped SBN:60 single crystals have been grown by the Czochralski technique, and crystals as large as 2-2.5 cm in diameter have been successfully developed. The crystal quality and striations seem to depend strongly on the type of dopant incorporated. For example, Ce-doped SBN:60 crystals exhibit no striations with excellent optical quality, while Fe-doped SBN:60 crystals are heavily striated. The Ce-doped crystals seem to have promising device applications and, hence further work on this crystal is in progress to optimize its photorefractive properties. Since the crystals have been grown in an oxygen atmosphere, it is difficult to predict whether both valance states are present. Therefore, future work will include the determination of dopant valance states and their effect on photorefractive sensitivity and speed. Measurements on the photorefractive effect in updoped and Ce-doped SBN:60 crystals have shown a 5.5 increase in the two-beam coupling coefficient for Ce-doped material, but with a similar response time 0.12 s. A band construction transport model is presented which indicates that response time may be reduced to 0.01 s or less by a decrease of the number of empty acceptor traps, NA, perhaps by means of crystal annealing in a partially reducing atmosphere. GRA

N85-24971# Maryland Univ., College Park. Dept. of Physics and Astronomy.
THEORY AND CALCULATIONS OF THE ELECTRONIC STRUCTURE OF SOLIDS HAVING DIRECTIONAL BONDING Final Report
C. S. Wang 1985 3 p
(Contract N00014-82-K-2020)
(AD-A151062) Avail: NTIS HC A02/MF A01 CSCL 20/12

Contents: The Energy Band Gap in Semiconductors and Insulators; Structural Properties of Solids; Magnetic and Structural Ordering in Iron; Anomalous Quantum Hall Effects. GRA

N85-24972# Florida Univ., Gainesville. Dept. of Electrical Engineering.
STUDY OF 1/F NOISE IN SOLIDS Final Report, 16 Jun. 1983 - 31 Jul. 1984
C. M. VanVliet and G. Bosman 31 Oct. 1984 76 p
(Grant AF-AFOSR-0226-82)
(AD-A151069; AFOSR-85-0121TR) Avail: NTIS HC A05/MF A01 CSCL 20/1

In the introduction an overview is given of the status of 1/f noise at the end of the contract period. We indicate that the 1/f noise observed in our laboratory, as well as in other places, quite often yields Hooge parameters of order 10-5 to 10-8, i.e., two to five orders less than a decade ago. Much of this noise can be seen as quantum 1/f noise which is the limiting noise that can be observed. Our measurements on submicron gallium arsenide devices, microwave narrow base transistors, and gold films at below the Debye temperature, and in radioactive decay and partition 1/f noise, all point in this direction. Over and above this limiting noise, additional 1/f-like noise is often observed. For this, the standard physical mechanisms, involving activation energy processes or tunneling processes, usually apply. More research on this larger 1/f noise is still needed. In the section on experimental work, we discuss the status of 1/f noise in transistors and in gold films. Also, we discuss the high frequency intervalley scattering noise in gallium arsenide devices. Good agreement with Monte Carlo simulations is obtained. New results are also presented for noise in radioactive decay. Both 1/f noise and Lorentzian flicker noise are observed. The flicker floor is lower for lower alpha-particle energies, in agreement with the quantum theory of 1/f noise. In the theory section of quantum 1/f noise is applied to electron phonon scattering. Explicit results for the resulting mobility-fluctuation noise and for the Hooge parameters involved are obtained. Numerical computations are in progress. GRA

N85-24973# Michigan Technological Univ., Houghton.
ENERGY TRAPPING, RELEASE, AND TRANSPORT IN THREE-DIMENSIONAL ENERGETIC SOLIDS AND MOLECULAR CRYSTALS: THEORY OF DEFECTS AND IMPURITIES Annual Technical Report, 1 Jan. - 31 Dec. 1984
A. B. Kunz 31 Dec. 1984 42 p Prepared in cooperation with Illinois Univ., Urbana
(Contract N00014-81-K-0620)
(AD-A151071; ATR-4) Avail: NTIS HC A03/MF A01 CSCL 02/2

In this report we describe progress in developing and implementing a general theoretical approach to describing the properties of defects and impurities of a general nature in nonmetallic solid systems. This approach combines fully correlated, fully self-consistent electronic structure determination of the electrical and mechanical properties associated with neutral or charged defects/impurities in or on a non-metal. The system remote from the defect is described by the shell model which incorporates self-consistently, host polarization and distortion. This results in our being able to obtain absolute energies of the impurity ions in the host and their interaction. The model is free of adjustable or undefined parameters. This project is of non-trivial magnitude and the current computer implementation, which is functional in our laboratory, consists of a program, ICECAP, which is about 100,000 statements long. GRA

N85-24974# Department of the Army, Washington, D. C.
CYLINDRICAL CRYSTAL RESONATOR Patent Application
A. Ballato, inventor (to Army) Filed 11 Feb. 1985 37 p
(AD-D011575; US-Patent-Appl-SN-700573) Avail: NTIS HC A03/MF A01 CSCL 09/5

Improvement of resonator circuit parameters, unwanted mode suppression, and the frequency-temperature characteristic of a crystal resonator is provided by a doubly cut crystal resonator plate having at least one major face including a cylindrical contour, the axis of which is parallel to the direction of the projection of the eigenvector (the normal coordinate) for the desired operating mode. The cylinder axis is at an angle to the doubly rotated electrical axis such that the fast shear b mode is suppressed while the slow shear c mode is unaffected. The radius of the cylinder is selectively chosen for altering the frequency-temperature characteristic. Author (GRA)

N85-24975# Wisconsin Univ., Milwaukee. Lab. for Surface Studies.
INTERACTION OF LOW ENERGY ELECTRONS WITH SURFACE LATTICE VIBRATIONS Final Report
S. Y. Tong 5 Nov. 1984 17 p refs
(Contract DE-AC02-79ER-10431)
(DE85-005475; DOE/ER-10431/1) Avail: NTIS HC A02/MF A01

Microscopic theory, with multiple scattering, was constructed for the inelastic scattering of electrons by surface vibrations. The theory was applied to detailed studies of angle and energy variations of the inelastic cross section for two important systems in surface physics: carbon monoxide molecules adsorbed on the (100) surface of a nickel crystal, and hydrogen atoms absorbed on a reconstructed tungsten (100) surface. These calculations have outlined general trends that are expected to apply to a wide variety of systems. Also, a series of new selection rules that apply to off specular scattering was discovered. Particularly interesting are pseudo-selection rules which are not group theoretical in origin, but approximate statements that hold well when the electron scattering amplitude exhibits a slow energy variation. Conditions for which these selection rules would hold and break down were found and defined. DOE

N85-24976# Oak Ridge National Lab., Tenn. Solid State Div.
ELECTROREFLECTANCE SPECTROSCOPY AS A PROBE OF THE ELECTRONIC STRUCTURE AT THE METAL-ELECTRONIC INTERFACE
K. M. Ho (Ames Lab., Iowa) and S. H. Liu 1984 6 p refs Presented at the Intern. Workshop on the Electromagnetic Response of Surfaces, Cholula, Mexico, 6 Aug. 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-82)
(DE85-003541; CONF-8408136-Draft) Avail: NTIS HC A02/MF A01

The electromagnetic response of a surface is influenced by the surface electronic structure. In particular, the existence of

surface states in band gaps can lead to optical absorption below the bulk interband threshold. However, such effects are usually too small to be observed because while surface states are localized within several atomic layers near the surface, light waves can penetrate at least hundreds of layers into the metal. One way to enhance the surface effect for a metallic surface is to make use of electromodulation techniques. When a metal is placed in an electrolyte, an intense electric field (approx. 10 to the 7th volts/cm) can be induced at the metal electrolyte boundary with the application of a bias voltage of less than a volt. Electroreflectance (ER) experiments modulate the bias voltage and measure the resultant modulations in the optical reflectivity. Since the static electric field is highly localized at the interface (the Fermi-Thomas screening length for typical metals is of the order of Angstroms) we expect the ER effect to be highly surface sensitive. Sensitivities in ((DELTA)R/R) up to 10 to the -6th can be achieved in such experiments. DOE

N85-24977# Stanford Linear Accelerator Center, Calif.
HIGH FIELD RF SUPERCONDUCTIVITY: TO PULSE OR NOT TO PULSE
Isidoro Enrico Campisi Oct. 1984 8 p refs Presented at the Applied Superconductivity Conf., San Diego, Calif., 9-13 Sep. 1984
(Contract DE-AC03-76SF-00515)
(DE85-004381; SU-SLAC-PUB-3433; CONF-840937-25) Avail: NTIS HC A02/MF A01

Experimental data on the behavior of superconductors under the application of RF fields of amplitude comparable to their critical fields are spotadic and not always consistent. In many cases the field level at which breakdown in superconducting RF cavities should be expected has not been clearly established. Tests conducted with very short (approx. 1 (MU)s) RF pulses indicate that in this mode of operation fields close to the critical values can be consistently reached in superconducting cavities without breakdown. The advantages and disadvantages of the pulsed method are discussed compared to those of the more standard continuous wave (CW) systems. DOE

N85-24978# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHAOTIC DYNAMICS OF INSTABILITIES IN SOLIDS
Carson D. Jeffries May 1984 78 p refs Presented at the 59th Nobel Symp.: The Phys. of Chaos and Related Phenomena, Graeftavallen, Sweden, 11-16 Jun. 1984
(Contract DE-AC03-76SF-00098)
(DE85-004909; LBL-17914; CONF-8406186-2) Avail: NTIS HC A05/MF A01

Chaotic dynamics in several solid state systems is reviewed. In each case the physical system is described, relevant equations of motion are given, experimental results are presented and interpreted, more or less, from the relevant equations, including numerical solutions. The systems are: (1) an electron-hole helical plasma density wave in a Ge crystal in parallel electric and magnetic fields; this shows period doubling and quasiperiodic routes to chaos; (2) standing mode spin wave packets in ferrite spheres, excited by driving ferromagnetic resonance of the uniform mode; this system shows period doubling to chaos and periodic windows; and (3) resonantly driven p-n junctions in Si show extremely nonlinear behavior due to charge stored during injection; one junction shows period doubling to chaos and period adding (frequency locking); coupled junctions show, in addition, quasi-periodicity, entrainment, and behavior generic to coupled nonlinear oscillator. The fractal dimension is measured for these systems. DOE

N85-24979# Sandia Labs., Albuquerque, N. Mex.
TRANSPORT STUDIES OF SEVERAL NOVEL ORGANIC CONDUCTORS
James F. Kwak, Larry J. Azevedo, James E. Schirber, Jack M. Williams, and Mark A. Beno 1984 10 p refs Presented at the Intern. Chem. Congr. of Pacific Basin Soc., Honolulu, Hawaii, 16 Dec. 1984 Prepared in cooperation with ANL, Ill.
(Contracts DE-AC04-76DP-00789; W-31-109-eng-38)
(DE85-003950; SAND-84-0959C; CONF-841210-7) Avail: NTIS HC A02/MF A01

Conductivity and thermopower measurements on several new conducting organic compounds were presented. The (BEDT-TTF) 2BrO4 is isomorphous with the superconducting ReO4 salt; data show it to be metallic above 200 K and semiconducting below 100 K, although without any clear transition. In (TMTSF)2SiF5 the anion is neither octahedral nor tetrahedral; however, results suggest behavior very like the octahedral salts. The (BEDT-TTF)2InBr4 is semiconducting at room temperature with an activation energy of .12 eV. Low-temperature conductivity measurements on (BEDT-TTF)2I3 at 0.5 kbar show suppression of the known ambient-pressure superconducting state to below 1 K, and an anomaly at 7 K reminiscent of the CDW transition in NbSe3. DOE

N85-24980# Oak Ridge National Lab., Tenn. Solid State Div.
HIGH RESOLUTION Z-CONTRAST IMAGING AND LATTICE LOCATION ANALYSIS OF DOPANTS IN ION-IMPLANTED SILICON
S. J. Pennycook, J. Narayan, R. J. Culbertson, E. P. Fogarassy, and P. E. Batson (IBM, Yorktown Heights, N.Y.) Dec. 1984 9 p refs Presented at the Symp. on the Scientific Basis for Nucl. Waste Management, Boston, 26-30 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005261; CONF-841157-57) Avail: NTIS HC A02/MF A01

Two new electron microscopy techniques were developed which greatly extend the capabilities for the micro-characterization of a semiconductor. The first is a technique for the direct imaging of dopants in semiconductors, whether or not they are in solution, using Z-contrast, and the second is a technique for determining the substitutional fraction of dopant. Both techniques are capable of nanometer spatial resolution and allow the detailed study of dopant segregation, precipitation, and clustering effects. DOE

N85-24981# Los Alamos Scientific Lab., N. Mex. Center for Nonlinear Studies.
SOLITON ENERGETICS IN EXTENDED PEIERLS-HUBBARD MODELS: A QUANTUM MONTE CARLO STUDY
D. K. Campbell, Thomas A. DeGrand (Colorado Univ., Boulder), and S. Mazumdar 1984 4 p refs
(Contract DE-AC02-81ER-40025)
(DE85-005409; DOE/ER-40025/T2) Avail: NTIS HC A02/MF A01

Using quantum Monte Carlo techniques, the effects of on site (U) and nearest neighbor (V) Hubbard interactions on the energetics of solitons in coupled electron phonon (Peierls) models of quasi-one dimensional materials are studied. DOE

N85-24982# Argonne National Lab., Ill. Materials Science and Technology Div.
RELATIONSHIP BETWEEN SYMMETRICAL TILT, TWIST, SPECIAL, AND FAVORED GRAIN BOUNDARIES
D. Wolf 1984 15 p refs Presented at the Intern. Conf. on the Structure and Properties of Internal Interfaces, Irsee, West Germany, 19-23 Aug. 1984
(Contract W-31-109-eng-38)
(DE85-004024; CONF-840884-3) Avail: NTIS HC A02/MF A01

Within the framework of the coincident-site lattice (CSL) model, grain boundaries with the lowest values of (SIGMA), the inverse density of CSL sites, are usually assumed to be special compared to high-(SIGMA) boundaries in that they are expected to show energy cusps. The selection criteria for the identification of special or favored interface are investigated. Based on the observation that a symmetrical tilt boundary on a given crystallographic plane may be considered as the most special of all twist boundaries on this plane, two simple qualitative selection criteria are formulated. These criteria demonstrate that low values of (SIGMA) are a necessary but not sufficient condition for the selection interfaces. The most important physical parameters governing the energies of grain boundaries are shown to be (1) the spacing of lattice planes parallel to the boundary plane, and (2) the area of the planar (CSL) unit cell on the boundary plane. DOE

N85-24983# California Univ., Riverside. Dept. of Physics.
PELTIER HEAT OF A SMALL POLARON IN A MAGNETIC SEMICONDUCTOR
Nai-Li H. Liu and David Emin (SNL, Albuquerque) 1984 17 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000470; SAND-84-1464C; CONF-841184-28) Avail: NTIS HC A02/MF A01

The heat transported with a small polaron in both antiferromagnetic and ferromagnetic semiconductors is calculated. This heat, the Peltier heat, (PI), is obtained from the change of the entropy of the total system upon introduction of a charge carrier. Both the intrasite and intersite exchange interactions between a small polaron and the interacting spins of a spin-1/2 magnet were studied. There are two competing magnetic contributions to the Peltier heat. First, adding the carrier increases the spin entropy of the system. Second, the exchange between the carrier and the sites about it enhances the exchange binding between these sites. At extremely high temperature when kT exceeds the intrasite exchange energy, the first effect dominates. Then (PI) is simply augmented by kTln2. However, well below the magnetic transition temperature the second effect dominates. In the experimentally accessible range between these limits both effects are comparable and sizable. The net magnetic contribution to the Peltier heat rises with temperature. Thus, a carrier's interactions with its magnetic environment produces a significant and distinctive contribution to its Peltier heat. DOE

N85-24984# Sandia Labs., Albuquerque, N. Mex.
ION IMPLANTATION DISORDER IN STRAINED-LAYER SUPERLATTICES
G. W. Arnold, S. T. Picraux, P. S. Peercy, D. R. Myers, R. M. Biefeld, and L. R. Dawson 1984 12 p refs Presented at the Symp. on the Scientific Basis for Nucl. Waste Management, Boston, 26 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-004466; SAND-84-0478C; CONF-841157-38) Avail: NTIS HC A02/MF A01

Cantilever beam bending and RBS channeling measurements have been used to examine implantation induced disorder and stress buildup in InO 2GaO 8As/GaAs SLS structures. The critical fluence for saturation of compressive stress occurs prior to amorphous layer formation and is followed by stress relief. For all the ions the maximum ion induced stress scales with energy density into atomic processes and stress relief occurs above approximately 1x10 to the 20th keV/1 cubic cm. Stress relief is more pronounced for the SLSs than for bulk GaAs. Stress relief may lead to slip or other forms of inelastic material flow in SLSs, which would be undesirable for active regions in device applications. Such material flow may be avoided by limiting maximum fluences or by multiple step or simultaneous implantation and annealing for high fluences. DOE

N85-24985# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Sciences and Engineering.
STRUCTURAL UNIT/GRAIN BOUNDARY DISLOCATION MODEL FOR TWIST BOUNDARIES IN CUBIC CRYSTALS
P. D. Bristowe and R. W. Balluffi Oct. 1984 16 p refs
(Contract DE-FG02-84ER-45116)
(DE85-000425; DOE/ER-45116/3) Avail: NTIS HC A02/F A01

The systemics of [001] twist boundary structure is presented formally in terms of a structure unit/grain boundary dislocation (GBD) hierarchical model and the earlier model of Sutton is generalized. By comparison with experimental observation and atomistic calculation using pair potential models, the physical significance of the individual members of the hierarchy is determined. Comparison with experiment indicates a strong < 110 > type primary relaxation for theta is equal to or < 36.9 deg. and a significant secondary relaxation near Sigma 5 which must result from oblique perturbations in the array of primary GBDs. On the other hand, comparison with available calculated results indicate a strong < 110 > type relaxation at low angles but a progressively weaker relaxation at higher angles. Also, no evidence is found for any significant secondary relaxations when at least one pair potential is employed. Author

N85-24986# Sandia Labs., Albuquerque, N. Mex.
InGaAs/GaAs, STRAINED-LAYER SUPERLATTICE (SLS), JUNCTION PHOTODETECTORS, LED'S, INJECTION LASER'S AND FET'S FOR OPTOELECTRONIC IC APPLICATIONS
T. E. Zipperian, L. P. Dawson, C. E. Barnes, J. J. Wiczer, and G. C. Osbourn 1984 15 p refs
(Contract DE-AC04-76DP-00789)
(DE85-001940; SAND-84-1574C; CONF-841234-3) Avail: NTIS HC A02/MF A01

A set of optoelectronic devices including p-n junction photodetectors, emitters (both on LED and a stripe geometry, injection laser), and a gain device were fabricated from In(0.2)Ga(0.8)As/GaAs strained layer superlattice (SLS) material. The photodetectors have demonstrated a peak external quantum efficiency at zero volts reverse bias of 50% at 770 nm and an optical absorption edge at 1050 nm. Both the LED and injection laser have peak, room temperature, emission wavelengths near 1020 nm. The laser exhibited CW, ti k operation at 976 nm with a threshold current of 95 mA, the first reported CW operation of an InGaAs/GaAs SLS laser. These encouraging results demonstrate that useful optical and electronic devices can be fabricated from mismatched materials and that the InGaAs/GaAs SLS system is an attractive candidate for integrated optoelectronic applications. B.G.

N85-24987# Oak Ridge National Lab., Tenn.
STRUCTURE AND PROPERTIES OF ION-IMPLANTED Al SUB 2 O SUB 3
C. J. McHargue, G. C. Farlow, C. W. White, B. R. Appleton, P. Angelini, and H. Naramoto (Japan Atomic Energy Research Inst., Tokai) 1984 18 p refs Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005374; CONF-841117-35) Avail: NTIS HC A02/MF A01

The effects of implantation parameters temperature (77 to 640 K), ion species (Cr, Zr, Nb, Al+C, Xe), and fluence (1 x 10(14) to 1 x 10(17) ions.cm(-2)) on the structure and surface hardness of Al2O3 were studied. Low temperatures favor the rapid accumulation of damage and formation of an amorphous layer. Except for zirconium, fluences in excess of 1 x 10(17) ions/cm (-2) are required to amorphize Al2O3 at 300 K. The amorphous phase has a hardness about 65% of that of the crystalline phase. DOE

N85-24988# Oak Ridge National Lab., Tenn. Solid State Div.
DOPANT INCORPORATION IN SILICON DURING NONEQUILIBRIUM SOLIDIFICATION: COMPARISON OF 2 PROCESSES
E. P. Fogarassy, D. H. Lowndes, J. Narayan, and C. R. White Jan. 1985 7 p refs Presented at the Mater. Res. Soc. Symp., Boston, 26-30 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005568; CONF-841157-64) Avail: NTIS HC A02/MF A01

The incorporation properties of implanted or deposited Sb into the silicon lattice during laser irradiation with a UV laser were studied. For both implanted or deposited Sb, a maximum substitutional concentration of 2.1 x 10(21)/cm(3) following laser melting and solidification at V approx. = 6 m/sec was found. In both cases, substitutional solubility was limited by interfacial instabilities which develop during regrowth. For the deposited case it was observed in addition a much larger cellular microstructure which may result from convection induced instabilities. DOE

N85-24989# Sandia Labs., Albuquerque, N. Mex.
NOVEL MATERIALS PROPERTIES OF STRAINED-LAYER SUPERLATTICES
G. C. Osbourn 1984 15 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE85-003676; SAND-84-13560; CONF-841218-10) Avail: NTIS HC A02/MF A01

Strained-layer superlattices (SLSs) are high quality structures grown from lattice-mismatched semiconductor materials. Recent Sandia studies have demonstrated that a variety of SLS material properties can be tailored through the flexible choice of layer materials and thicknesses and through the use of quantum size effects, zone folding effects, and strain effects. The use of strained layers in SLS's allows these structures to exhibit a number of novel features. Examples of these features include: independently variable band gap and lattice constant using mismatched ternaries; strain-induced band gap shifts; and strain-modified effective masses. These features provide the opportunity for a variety of fundamental and applied materials studies using SLS systems. DOE

N85-24990# Sandia Labs., Albuquerque, N. Mex.
STRAINED-LAYER SUPERLATTICES AND STRAIN-INDUCED LIGHT HOLES
G. C. Osbourn 1984 7 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-003675; SAND-84-14530; CONF-841157-22) Avail: NTIS HC A02/MF A01

The capability of growing high quality strained-layer superlattices (SLS's) from lattice-mismatched semiconductors opens up new opportunities in both basic and applied material sciences. This flexibility in the choice of SLS layer materials allows the study of quantum well effects in a variety of new and interesting heterojunction systems. In addition, the large tetragonal distortions of the SLS layers allow these structures to exhibit features which are not found in bulk semiconductors. An exciting example is the possibility of tailoring certain SLS materials so that they exhibit small two-dimensional hole effective masses and enhanced low field hole mobilities at low temperatures and low carrier concentrations. Band structure calculations indicate that the layer strains, the direct band gap magnitudes of the layers, the valence band offset, and the hole energies all can play a role in determining these small two-dimensional hole effective mass values. DOE

N85-24126# Joint Publications Research Service, Arlington, Va.
STRUCTURAL, MORPHOLOGICAL AND OPTICAL CHARACTERISTICS OF KGd(WO4)2 CRYSTALS Abstract Only
G. V. Ananyeva, I. I. Afanasyev, A. I. Glazov, I. Ya. Mamontov, and T. I. Merkulyayeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 83-84 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 8, Aug. 1983 p 35-36
(For primary document see N85-24034 14-31)
Avail: NTIS HC A06

N85-24134# Joint Publications Research Service, Arlington, Va.
THRESHOLDS OF OPTICAL BREAKDOWN IN ALKALI-HALIDE CRYSTALS UNDER PULSES FROM CO2-LASER Abstract Only
N. V. Volkova, V. P. Krutyakova, V. N. Smirnov, and P. N. Tsirulnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-84-001) 9 Feb. 1984 p 88-89 Transl. into ENGLISH from Opt.-Mekhan. Prom. (Leningrad), no. 7, Jul. 1983 p 10-13 (For primary document see N85-24034 14-31)
Avail: NTIS HC A06

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-24991# National Physical Research Lab., Pretoria (South Africa).
THERMODYNAMIC CALCULATIONS AND THE CHEMICAL VAPOUR DEPOSITION OF HARD MATERIALS
A. I. Kingon and R. F. Davis (North Carolina State Univ., Raleigh) [1982] 6 p refs
Avail: NTIS HC A02/MF A01

The importance of thermodynamic calculations for the chemical vapor deposition (CVD) of hard materials is emphasized. Examples are given for the SiC and Si3N4 systems by the use of calculated CVD phase diagrams. Author

N85-24992# Colorado Univ., Boulder.
LATTICE MONTE CARLO CALCULATIONS OF FINITE TEMPERATURE QCD
Thomas DeGrand 1984 23 p refs Presented at the 4th Intern. Conf. on Ultrarelativistic Nucleus-Nucleus Collisions (QUARK MATTER '84), Helsinki, 17 Jun. 1984
(Contract DE-AC02-81ER-40025)
(DE85-004035; DOE/ER-40025/31; CONF-8406189-9; HU-TFT-84-35) Avail: NTIS HC A02/MF A01

The status of the lattice description of the deconfinement transition and the properties of hadronic matter at high (and low) temperature T are discussed. An ultimate goal of these investigations is to learn whether or not QCD actually predicts the naive phase diagram. A more realistic goal, which is at present partially within grasp, is to compute the static properties of QCD matter at $T > 0$ from first principles. These include the order of phase transitions, critical temperatures T/sub c/, critical exponents or latent heat, but not dynamical critical properties, such as the behavior of Green's functions near T/sub c/. No first- principles discussions of non-equilibrium properties of QCD, which would be required for a description of the experiments are known. In fact, experimentalists should think of the world studied by lattice or Monte Carlo methods as a little crystal in an oven whose temperature is kept constant in time. A short description is given of how to set up the finite-temperature field theory on a lattice to display the important parts of the calculation without going too much into details. Then recent progress in the understanding of the glue world - pure gauge theories is discussed and end by discussing the physically relevant case of fermions and gauge fields. DOE

N85-24993# Rome Univ. (Italy). Dipt. di Fisica.
DISCOVERY REFUTATION AND VERIFICATION REFUTATION: THE PROPOSALS OF VON NEUMANN AND WIENER IN THE DEVELOPMENT OF 20TH CENTURY PHYSICS [CONTESTO DELLA SCOPERTA E CONTESTO DELLA CONVALIDA: LE PROPOSTE VON NEUMANN E DI WIENER NELLO SVILUPPO DELLA FISICA DEL '900]
Marcello Cini 10 Jan. 1985 32 p refs In ITALIAN Presented at 5th Congr. Nazl. di Storia della Fis., Rome, 1984
(NOTA-INTERNA-840) Avail: NTIS HC A03/MF A01

The existence of metacriteria in the scientific community, by which choices are made by beliefs on the nature of physics rather than by criteria internal to physics is discussed. The problem is illustrated by the conflicting proposals of Von Neumann and Wiener. Epistomological aspects from Popper and Kuhn are also discussed. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-24994*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE IMPACT OF SCIENCE ON SOCIETY
James Burke, Jules Bergman, and Isaac Asimov 1985 98 p Lectures held in Williamsburg, Va., 1983
(NASA-SP-482; L-15858; NAS 1.21:482; LC-84-14159) Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 05K

Four speeches delivered as part of a public lecture series to assess the impact of science on society are presented. The computerization of society, space exploration and habitation, the

mechanisms of technological change, and cultural responses are addressed. For individual titles, see N85-24995 through N85-24998.

N85-24995*# British Broadcasting Corp., London (England).
THE LEGACY OF SCIENCE
James Burke *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 3-32 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 05K

The mechanisms of techno-scientific and philosophical change are examined and related to the nature and transformation of society and mankind himself. In parallel with the notion that the fundamental mechanism of change is the free juxtaposition of disparate phenomena, it is suggested that, with the tools that modern technology provides, we may be moving toward a no-paradigm culture. M.G.

N85-24996*# American Broadcasting Co., New York.
ACCOMPLISHMENTS OF SCIENCE BY THE YEAR 2000 c85
Jules Bergman *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 32-55 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 05K

Current and projected accomplishments in science and technology are examined from a social and political perspective. It is observed that the present level of research and development in the United States is inadequate for many possible advancements to occur. M.G.

N85-24997*# Asimov (Isaac), Boston, Mass.
OUR FUTURE IN THE COSMOS: COMPUTERS c60
Isaac Asimov *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 58-75 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 09B

The future of computers and the computerization of society are discussed. Speculation regarding the nature and appropriate application of computer intelligence and human intelligence is given. M.G.

N85-24998*# Asimov (Isaac), Boston, Mass.
OUR FUTURE IN THE COSMOS: SPACE
Isaac Asimov *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 77-96 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 05K

The possibility and consequences of the extension of human society into space are addressed. The establishment of space colonies, orbital power plants and factories, and space exploration are discussed. The necessity of world cooperation to realize such projects and the development of a global space-centered society are considered. M.G.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-24999*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVESTIGATIONS CARRIED OUT UNDER THE DIRECTOR'S DISCRETIONARY FUND Annual Report, 1 Oct. 1983 - 30 Sep. 1984
M. T. Chahine 28 Mar. 1985 178 p refs Sponsored in part by NASA
(NASA-CR-175676; JPL-D-2072; NAS 1.26:175676) Avail: NTIS HC A09/MF A01 CSCL 05A

This annual report comprises a set of summaries, describing task objectives, progress and results or accomplishments, future outlook, and financial status for each director's discretionary fund (DDF) task that was active during fiscal year 1984. Publications and conference presentations related to the work are listed. The individual reports are categorized as interim or final according to whether the task efforts are ongoing or completed. A partial list of new tasks to be initiated with fiscal year 1985 funds and a glossary of abbreviations and acronyms, used by the task authors in their summaries are included. The table of contents lists the DDF reports in sequence by their task number, which is derived from the 13-digit code assigned to account for the fund awarded to the task project. E.A.K.

N85-25000# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FISCAL YEAR 1986 TECHNICAL OBJECTIVE DOCUMENT Annual Report
Wright-Patterson AFB, Ohio AFWAL Feb. 1985 91 p Supersedes AFWAL-TR-84-2000, AD-A140581
(AF Proj. 9991)
(AD-A151039; AFWAL-TR-85-2000; AFWAL-TR-84-2000) Avail: NTIS HC A05/MF A01 CSCL 21/5

This Technical Objective Document (TOD) has been prepared by the Aero Propulsion Laboratory to provide science and industry with specific technical objectives which the Air Force feels are critical to maintain aerospace superiority in the future. The TOD contains three functional areas (Aircraft, Missile and Space) which provide planning objectives covering the technical disciplines and airbreathing propulsion, aerospace vehicle power, fire protection, and aircraft and missile fuels and lubrication.
Author (GRA)

N85-25001# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
MINIMAL COST FLOW IN PROCESSING NETWORKS: A PRIMAL APPROACH
J. Koene 1983 168 p refs
(CWI-TRACT-4; B8441038; ISBN-90-6196-270-6) Avail: NTIS HC A08/MF A01

Processing network problems are considered. Procedures in the primal simplex algorithm for LP-problems with simple upper bounds is discussed. Hall's theorem is applied to generalized processing network problems. Mathematical models for the minimal cost flow problem in pure or generalized processing networks are given. Procedures developed can be applied in solving real-world industrial or managerial problems. Expected computational results are discussed. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-25002* National Aeronautics and Space Administration, Washington, D. C.
NASA THESAURUS SUPPLEMENT, A THREE PART CUMULATIVE SUPPLEMENT TO THE 1982 EDITION OF THE NASA THESAURUS
Jan. 1985 38 p
(NASA-SP-7051(Suppl-3); NAS 1.21:7051(Suppl-3)) Avail: NTIS HC $6.50 CSCL 05B

The three part cumulative NASA Thesaurus Supplement to the 1982 edition of the NASA Thesaurus includes Part 1, Hierarchical Listing, Part 2, Access Vocabulary, and Part 3, Deletions. The semiannual supplement gives complete hierarchies for new terms

and includes new term indications for entries new to this supplement. A.R.H.

N85-25003 Purdue Univ., Lafayette, Ind.
THE RETRIEVAL EXPERT MODEL OF INFORMATION RETREIVAL Ph.D. Thesis
Scott Craig Deerwester 1984 102 p
Avail: Univ. Microfilms Order No. DA8500361

The purpose of an information retrieval system is to meet information needs. People who are expert at meeting information needs go about satisfying them much differently and, in general, more successfully than automated systems. A descriptive model of how these experts satisfy information needs is described. This model can be used prescriptively in the design of an information retrieval system whose performance is similar to that of a human expert. Dissert. Abstr.

N85-25004 University of Southern California, Los Angeles.
SCHEMA THEORY IN THE REPRESENTATION AND ANALYSIS OF TEXT Ph.D. Thesis
Sherrilynne Shirley Fuller 1984 189 p
Avail: Univ. Microfilms Order No. DA8500206

One of the most pressing issues in perfecting document retrieval methods is the establishment of rationale criteria for deciding how to index stored documents for purposes of later retrieval. Approaches to indexing have tended to focus on the word or sentences level rather than on the structure of the whole document. Linguists and cognitive psychologists suggest that texts have an inherent structure termed a schema which is used by individuals not only to understand texts but also to produce texts. Further, text schemata of different groups of individuals are thought to vary. A trial schema consisting of essential trial elements was designed based upon a review of the literature. A random sample of trial reports was selected by a search of the Medline database and stratified by disease category. The findings suggest that schema theory may offer a paradigm for indexing which provides a means of capturing both the intradocument, i.e., the holistic structure of the document as well as the inter-document relationships, i.e., data on groups of documents. Further study is indicated. Author

N85-25005 Purdue Univ., Lafayette, Ind.
EFFICIENT CONTEXTUAL MEASURES FOR CLASSIFICATION OF MULTISPECTRAL IMAGE DATA Ph.D. Thesis
Herbert Gary Greene 1984 126 p
Avail: Univ. Microfilms Order No. DA8500376

Several efficient spatial context measures are developed from different structural models for four-nearest-neighbor neighborhoods. Most of these measures rely on simple manipulations of label probabilities generated by a noncontextual classifier. They are efficient computationally and are effective in improving classification accuracy over the noncontextual result. Among other schemata, the measures include: average label probabilities in a neighborhood; label probabilities combined as a function of a metric in the label probability space; and context through semantic constraints within a Bayesian framework. In addition, an efficient implementation of a contextual classifier based on compound decision theory is developed through a simplification of the structure of the contextual prior probability. No accuracy is lost through the simplification, but computational speed is increased 15-fold. Finally, a procedure to combine label probabilities from independent data sources is proposed. A mechanism for combining the label probabilities from each of the sources as a function of their independent classification accuracies is created and evaluated. Dissert. Abstr.

N85-25006# Naval Postgraduate School, Monterey, Calif.
DESIGN AND ANALYSIS OF ORDERING AND JOIN FOR A MULTI-BACKED DATABASE SYSTEM M.S. Thesis
S. Muldur Jun. 1984 107 p
(AD-A150711) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis proposes implementations of the sort and join in the Multi-Backend Database System. The idea of implementing these operations is to provide better support for relational databases and relational language interfaces. The key issue analyzed is the distribution of functionality of the operation across the multiple minicomputers of the MDBS architecture. The join analysis also examines alternative join algorithms. Author (GRA)

N85-25007# Planning Systems, Inc. Slidell, La.
COMMERCIAL DATA BASE MANAGEMENT SYSTEM FOR GEONAMES DATA BASE Final Report
G. Langran, J. Campbell, and E. Gough Bay St. Louis, Miss. Naval Ocean Research and Development Activity Dec. 1984 26 p
(Contract N00014-83-C-0657)
(AD-A150835; NORDA-73) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Defense Mapping Agency, with the help of the Naval Ocean Research and Development Activity, is conducting a large effort to automate production of maps, gazetteers, charts, and similar products. One element of this effort is the creation of a single, controlled source for the placenames used in these products: the Geonames Data Base. Because of its size (up to 10 bytes) and user requirements (up to 25 simultaneous users), the Geonames Data Base belongs to a special subset of current data base management practice the Very Large Data Base. From requirements generated earlier by DMA, NORDA, and others, this task surveys commercial data base management systems (DBMS) to determine candidates for the Geonames DBMS. These systems are then ordered by objective and subjective measures of performance to help in selecting the Geonames DBMS. Among the systems which may satisfy the requirements of the Geonames Data Base, two are used widely today and are exceptionally well regarded by current users. These systems are DMS/R and ADABAS. GRA

N85-25008# Rome Univ. (Italy). Dipt. di Fis.
THE CONSERVATION AND UTILIZATION OF SCIENTIFIC RESEARCH DOCUMENTS: PRACTICAL ASPECTS AND ORGANIZATION [LA CONSERVAZIONE E L'USO DELLA DOCUMENTATAZIONE RIGUARDANTE LA RICERCA SCIENTIFICA: ASPETTI PRACTICI E ORGANIZZATIVI]
C. Tarsitani 16 Oct. 1984 40 p refs In ITALIAN Sponsored by Academia Nazionale delle Scienze and American Institute of Physics, New York
(NOTA-INTERNA-834) Avail: NTIS HC A03/MF A01

The conservation of documents and information retrieval procedures used in research concerning the history of sciences is discussed following the observations made by the author on the techniques adopted in the United States. Author (ESA)

N85-23880# Quebec Univ., Sainte-Foy. Inst. National de la Recherche Scientifique.
REPORT ON THE PANEL DISCUSSION OF THE WORKSHOP ON DATA COLLECTION PLATFORM NETWORKS
Jean-Pierre Fortin *In* CNES Data Collection and Platform Location by Satellite 1980 4 p In FRENCH; ENGLISH summary (For primary document see N85-23869 14-15)
Avail: NTIS HC A07/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-25009*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SYSTEM-LEVEL MATHEMATICAL MODEL FOR EVALUATION OF POWER TRAIN PERFORMANCE OF LOAD-LEVELED ELECTRIC-VEHICLES
G. P. Purohit (Hughes Aircraft Co., Los Angeles) and C. J. Leising Sep. 1984 37 p
(Contract NAS7-918; JPL Proj. 5030-574; Contract DE-AI01-78CS-54209)
(NASA-CR-175652; JPL-PUBL-84-85; NAS 1.26:175652; DOE/CS-54209/23) Avail: NTIS HC A03/MF A01 CSCL 13F

The power train performance of load leveled electric vehicles can be compared with that of nonload leveled systems by use of a simple mathematical model. This method of measurement involves a number of parameters including the degree of load leveling and regeneration, the flywheel mechanical to electrical energy fraction, and efficiencies of the motor, generator, flywheel, and transmission. Basic efficiency terms are defined and representative comparisons of a variety of systems are presented. Results of the study indicate that mechanical transfer of energy into and out of the flywheel is more advantageous than electrical transfer. An optimum degree of load leveling may be achieved in terms of the driving cycle, battery characteristics, mode of mechanization, and the efficiency of the components. For state of the art mechanically coupled flyheel systems, load leveling losses can be held to a reasonable 10%; electrically coupled systems can have losses that are up to six times larger. Propulsion system efficiencies for mechanically coupled flywheel systems are predicted to be approximately the 60% achieved on conventional nonload leveled systems. Author

N85-25010*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE TESTING AND SYSTEM CHARACTERIZATION. DOE HYBRID TEST VEHICLE, PHASE 3
Marc C. Trummel, Raymond J. Freeman, and Steven D. Mazor 15 Dec. 1984 86 p refs
(Contract NAS7-918; JPL Proj. 5030-572; Contract DE-ACI01-CS54-00209)
(NASA-CR-175668; JPL-PUBL-84-69; NAS 1.26:175668; DOE/CS-54209/21) Avail: NTIS HC A05/MF A01 CSCL 13F

The results of the Jet Propulsion Laboratory (JPL) Phase III test program of the Hybrid Test Vehicle (HTV) are presented. The test program was designed to obtain data intended to: (1) measure the quantitative performance of the vehicle for comparison with program goals and (2) characterize the engineering performance of the vehicle to provide a data base for future hybrid-vehicle designs. The results of the test program showed that the HTV essentially met the design requirements. It performed, handled, and appeared to the operator in a manner expected of current passenger vehicles while it demonstrated the capability of saving up to 54% of the petroleum used by a comparable gasoline-powered vehicle. The test program demonstrated the successful application of three new technologies in a hybrid vehicle. Testing experience showed that, in future hybrid-vehicle designs, careful attention should be paid to the use of standard automotive parts and to the incorporation of a battery designed for the specific requirements of the hybrid vehicle. Author

N85-24996*# American Broadcasting Co., New York.
ACCOMPLISHMENTS OF SCIENCE BY THE YEAR 2000
Jules Bergman *In* NASA. Langley Research Center The Impact of Sci. on Soc. 1985 p 32-55 (For primary document see N85-24994 14-80)
Avail: NTIS HC A05/MF A01; SOD HC $4.50 as SN033-000-00943-7 CSCL 05K

88 SPACE SCIENCES (GENERAL)

N85-25011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MEASUREMENT OF THE NIGHTTIME INFRARED LUMINOSITY OF SPACELAB 1 IN THE H- AND K-BANDS
Fred C. Witteborn, Kevin OBrien, and Lawrence Caroff Mar. 1985 18 p refs
(NASA-TM-85972; A-9785; NAS 1.15:85972) Avail: NTIS HC A02/MF A01 CSCL 13F

Infrared measurements of the Spacelab 1, Space Transportation System 9, were made from the Maui Optical Station tracking facility using a sensitive photometer n two infrared bands, the H-band centered at a wavelength of 1.6 microns and the K-band centered at 2.3 micrometers. The objective was to measure radiation from the vicinity of the Shuttle arising from interaction of Shuttle surfaces with atmospheric particles. It was necessary to include the Shuttle itself in the field of view of the photometer. The integrated brightness of the entire Shuttle at a distance of 400 km was found to be equivalent to that of a star of magnitude +6.6 or 1.6 microns; it was much fainter in the visible. Most of the emission at 1.6 microns appears to be attributable to the Shuttle glow phenomenon. It is hundreds of times brighter than the zodiacal background. The radiation at 2.3 microns can be accounted for primarily by diffusely scattered thermal radiation from Earth's surface. Author

N85-25012# Technische Univ., Berlin (West Germany). Inst. fuer Astronomie und Astrophysik.
[ACTIVITIES REPORT OF THE INSTITUTE FOR ASTRONOMY AND ASTROPHYSICS] Annual Report, 1983 [INSTITUT FUER ASTRONOMIE UND ASTROPHYSIK DER TECHNISCHE UNIVERSITAET BERLIN, JAHRESBEREICHT FUER DAS JAHR 1983]
R. Wielen 1984 9 p refs In GERMAN
(Mitt-5) Avail: NTIS HC A02/MF A01

Normal stars, helium-and Ap-stars, variable stars and X-ray sources, dust formation and interstellar matter; stellar systems; astronomical satellite HIPPARCOS; stars close to the Sun; star clusters; Milky way and galaxies; galactic clusters; and instrument development for X-ray astronomy are discussed. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-25013 Columbia Univ., New York.
A SOFT X-RAY SURVEY OF GALACTIC SUPERNOVA REMNANTS WITH THE EINSTEIN OBSERVATORY Ph.D. Thesis
Ryszard Lech Pisarski 1984 130 p
Avail: Univ. Microfilms Order No. DA8427449

The Einstein Observatory was used to observe 19 galactic supernova remnants in the soft X-ray band. The X-ray luminosities

and X-ray morphologies of the remnants were then compared to optical and radio data, with some large scale correlation between the radio and X-ray features noted in several of the remnants. The temperature of the emitting X-ray plasma was obtained through a spectral analysis of each remnant in the sample. Detailed analyses were carried out on the two remnants representing the extremes in age. Dissert. Abstr.

N85-25014 Columbia Univ., New York.
A ROCKET-BORNE X-RAY OBSERVATION OF SN1006 WITH THE IMAGING GAS SCINTILLATION PROPORTIONAL COUNTER Ph.D. Thesis
Michael Haig Vartanian 1984 212 p
Avail: Univ. Microfilms Order No. DA8427491

An imaging spectrophotometric observation of the galactic supernova remnant (SNR) SN1006 in the soft X-ray band (0.1 to 1.4 keV) was carried out. The experiment used the Columbia Imaging Gas Scintillation Proportional Counter (IGSPC) at the focal plane of a rocketborne X-ray telescope. SN1006 was the subject of much interest, both theoretical and observational, in recent years but its basic nature has remained quite controversial. It was felt that such an object would be an ideal target by which to prove the advantages of the IGSPC for use in X-ray astronomy. The integrated height spectrum is analyzed in terms of recent nonequilibrium ionization (NEI) thermal emission codes, which are expected on first principles to give a more accurate description of the emission than earlier equilibrium models. Parameters characterizing the SNR and the surrounding interstellar medium are then derived under the simplifying assumption of spatial homogeneity.
Dissert. Abstr.

N85-25015*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMETARY ASTROMETRY
Donald K. Yeomans, ed., Richard M. West, ed. (European Southern Observatory), Robert S. Harrington, ed. (Naval Observatory), and Brian G. Marsden, ed. (Harvard-Smithsonian Center for Astrophysics) 15 Nov. 1984 226 p refs Proc. of workshop held in Garching, West Germany, 18-19 Jun. 1984; sponsored by the European Southern Observarory and the International Halley Watch
(Contract NAS7-918)
(NASA-CR-175660; JPL-Pub-84-82; NAS 1.26:175660) Avail: NTIS HC A11/MF a01 CSCL 03A

Modern techniques for making cometary astrometric observations, reducing these observations, using accurate reference star catalogs, and computing precise orbits and ephemerides are discussed in detail and recommendations and suggestions are given in each area. For individual titles, see N85-25016 through N85-25043.

N85-25016*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ASTROMETRY NETWORK OF THE IHW AND THE P/CROMMELIN TRIAL RUN RESULTS
Donald K. Yeomans *In its* Cometary Astrometry 15 Nov. 1984 p 4-6 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

In an effort to test the techniques and communication lines of the entire International Halley watch (IHW) organization, comet Crommelin was selected as a comet that would act as a trial run for the future observations of comets Halley and Giacobini-Zinner. Astrometry network members were asked to provide a few observations of comet Crommelin during a period within a few months on either side of the comet's perihelion passage. Special comet Crommelin star catalogs were distributed and each observer was asked to observe, reduce and transmit their data as quickly as possible. Some 372 astrometric observations from 42 different observatories were received at the orbit determination center. Orbit information and up-to-date ephemerides were computed and distributed by the same communication channels. The comet Crommelin trial run was successful in pointing out some areas that need to be improved to make the data more accurate and the communication channels more efficient. B.G.

N85-25017*# Remeis Sternwarte, Bamberg (West Germany).
CURRENT IDEAS ON THE NATURE OF COMETS c91
Juergen Rahe *In* JPL Cometary Astrometry 15 Nov. 1984 p 7-13 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

The chemical composition, emission and line spectra, and structure of comet nuclei, cometary atmospheres, and comet tails are discussed. The role of ultraviolet and infrared astronomy in defining comets is examined. B.G.

N85-25018*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEAR-NUCLEUS STUDIES OF COMET HALLEY c91
Stephen Larson (Arizona Univ., Tucson) and Zdenek Sekanina *In* JPL Cometary Astrometry 15 Nov. 1984 p 14-20 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

The near-nucleus dust coma structure of Comet Halley are studied using modern digital image processing techniques on photographs taken in 1910. Recent investigations carried out in conjunction with the Near-Nucleus Studies Net of the IHW to better understand the characteristics and behavior of Comet Halley are reviewed. A new image processing algorithm developed to enhance coma feature boundaries permits their evolution over as many as three days to be followed. The features can be modeled to derive information on the nucleus spin vector, particle sizes, ejection velocities and distribution of emission areas on the nucleus. Useful contributions by observers in the Astrometry Net are also discussed. Author

N85-25019*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
REMARKS ON COMETARY ASTROMETRY
Brian G. Marsden *In* JPL Cometary Astrometry 15 Nov. 1984 p 27-33 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

A statistical examination of the astrometric observations made during the past 20 years indicates that there are generally sufficient data on bright and well-publicized comets. On the other hand, astrometric coverage of fainter objects has recently become a severe problem. In spite of an increase in the number of participating observatories, fewer observatories are making significant contributions. Automated methods have generally improved the quality of observations. The timely communication of observations is also discussed. Author

N85-25020*# Royal Observatory, Edinburgh (Scotland).
COMETARY ASTROMETRY WITH SCHMIDT CAMERAS
K. S. Russell *In* JPL Cometary Astrometry 15 Nov. 1984 p 34-40 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

A great many of the professional comet discoveries are made using wide field Schmidt telescopes. In particular the Palomar Schmidt, the ESO Schmidt in Chile and the UK Schmidt at Siding Spring Observatory in Australia. The wide field of view and fast f ratio are two of the distinctive features of this design which make it attractive for comet work. The techniques described refer to those in current use on the UK Schmidt. However in large part the methods described may be applied quite widely. Author

N85-25021*# Denver Univ., Colo. Dept. of Physics.
ASTROMETRY OF COMETS USING HYPERSENSITIZED TYPE 2415 FILM
Edgar Everhart *In* JPL Cometary Astrometry 15 Nov. 1984 p 41-44 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Kodak Technical Pan Film 2415 should be known to those doing cometary astrometry. It has exceedingly fine resolution (320 lines/mm) and, when properly hypersensitized, it is almost as fast as treated IIIa-J plates and reaches fainter stars. Reciprocity

failure with the treated film is practically zero, and the shelf life of treated film sheets is about a month at 2 C stored in a nitrogen atmosphere. This film is readily available in 4 by 5-inch sheets and is inexpensive. The film base is Estar, a plastic chosen for its stability. Over 120 astrometric measures of negatives on this film have shown a median residual error in comet positions of 1.1 seconds, a value that compares favorably with those of most observatories reporting positions. Author

N85-25022*# Karlova Univ., Prague (Czechoslovakia). Dept. of Astronomy and Astrophysics.
ASTROMETRIC PLATES OBTAINED AT THE PRIMARY FOCUS OF LARGE APERTURE REFLECTORS
A. Markos *In* JPL Cometary Astrometry 15 Nov. 1984 p 45-47 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Coma, astigmatism, and great differences in stellar magnitudes between photographed object and reference stars constitute the main sources of errors in measuring positional plates. These three sources of error can easily be eliminated by the method used at the Klet Observatory for obtaining precise observations of faint objects. The astrometric plates are taken by the method of two diaphragms. The first diaphragm, with a small central aperture; is located in front of the photographic plate. The second diaphragm is situated in front of the mirror. By a very short (of the order of tens of seconds) exposure a sufficient number of reference stars can be obtained throughout the entire plate. The stars are very well defined to the very edge of the plate and are easy to measure. Moreover, this method makes it possible to use plates of larger dimensions than usual so that it is always possible to find the necessary reference stars. B.G.

N85-25023*# Kitt Peak National Observatory, Tucson, Ariz.
KITT PEAK MEASUREMENTS OF P/HALLEY POSITIONS
Michael J. S. Belton *In* JPL Cometary Astrometry 15 Nov. 1984 p 48-57 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Techniques used for the acquisition and reduction of imaging data for astrometric positions of comet Halley at Kitt Peak National Observatory are described. These techniques are applicable to the comet while it is fainter than magnitude V approximately 21. They yield positions that are uncertain by + or - 0.9 arcsec. The reliability and consistency of the positions already derived could be improved by as much as a factor of four in a more ambitious astrometric program. Author

N85-25024*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
PROBLEMS AND PROCEDURES OF COMETARY ASTOMETRY
R. E. McCrosky *In* JPL Cometary Astrometry 15 Nov. 1984 p 58-65 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Photography of comets or asteroids for the purpose of astrometry requires consideration of a few details not met with in other astronomical problems. In the general case the object has a substantial non-sidereal motion and the decision must be made whether to track on the fiducial stars or on the object. The best method for introducing the required image motion compensation to the detector will depend on the focal plane facilities. Measurement of elongated images and the problems involved are discussed. B.G.

N85-25025*# European Southern Observatory, La Silla (Chile).
ASTOMETRY AT LA SILLA
R. M. West *In* JPL Cometary Astometry 15 Nov. 1985 p 60-65 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Astronomy of comets and minor planets is done regularly at ESO, La Silla, Chile. Plates are obtained with the 1 m Schmidt telescope and the 40 cm GPO, and CCD frames with the Danish 1.5 m telescope. Reductions are carried out by microdensitometer scanning and image processing at ESO, Garching, FRG. P/Halley will be observed intensively during the interval from perihelion passage on 9 February 1986 until the middle of March 1986. Almost real-time, accurate positions will be made in support of the spacecraft missions. Author

N85-25026*# Mount John Univ. Observatory, Lake Tepako (New Zealand).
THE ASTROMETRY PROGRAMME AT MT. JOHN OBSERVATORY
A. C. Gilmore and P. M. Kilmartin *In* JPL Cometary Astrometry 15 Nov. 1984 p 66-70 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

The comet (and minor planet) astrometry program uses one of two 0.6 meter (24 in.) Cassegrain telescopes at Mt. John University Observatory. For astrometric photographs of comets and minor planets a simple guide probe camera is attached to the Cassegrain. Frequently the Cassegrain field does not include sufficient cataloged stars for a satisfactory reduction. In these cases the comet position is transferred to an astrograph plate. Ephemeris data are calculated to the tenth of a day nearest the meridian transit of the object or for dusk or dawn twilight for low objects. Star measurement and identification are checked by reducing positions of cataloged stars. B.G.

N85-25027*# Academia Sinica, Nanking (China).
THE ASTROMETRY NETWORK OF OBSERVERS IN CHINA
S. M. Gong *In* JPL Cometary Astrometry 15 Nov. 1984 p 71-73 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

In China, the Purple Mountain Observatory (32 deg. 04 min. N and 118 deg. 49 min. E), the Shanghai Observatory (31 deg 06 min N and 121 deg 11 min E), and the Qingdao Station (36 deg 05 min N and 120 deg 19 min E) will take part in the astrometry of Halley's Comet. The astrometric work together with the instrumentation used, is given. Author

N85-25028*# Tokyo Astronomical Observatory, Mitaka (Japan).
THE ASTROMETRY NETWORK OF OBSERVERS IN JAPAN
Yoshihide Kozai *In* JPL Cometary Astometry 15 Nov. 1984 p 74-75 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

The astrometric network of observers and the main telescopes for professional and amateur astronomers in Japan and their availability for the International Halley Watch (IHW) are described. Author

N85-25029*# Academy of Sciences of the Ukrainian SSR, Kiev (USSR).
THE ASTROMETRY NETWORK OF OBSERVERS IN USSR
S. P. Major and Yu. A. Shokin *In* JPL Cometary Astrometry 15 Nov. 1984 p 76-83 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

A list of observatories included in the Soviet Astrometry Network is given. Some aspects of Astrometry Network activity are discussed. The Comet Halley star catalog is outlined. Author

N85-25030*# Hamburger Sternwarte (West Germany).
DESIRED CHARACTERISTICS OF CATALOGS FOR COMETARY ASTROMETRY
Chr. deVegt *In* JPL Cometary Astrometry 15 Nov. 1984 p 87-92 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

Reference star catalogs for cometary astrometry have to provide an all-sky coverage with suitable stellar density and limiting magnitude on a fundamental coordinate system. A general catalog meeting all these requirements will not be available for a foreseen timescale. The suitability of various existing catalogs for cometary astrometry is discussed. Author

N85-25031*# Naval Observatory, Washington, D.C.
THE IHW REFERENCE STAR CATALOGS FOR COMETS HALLEY AND GIOCOBINI-ZINNER
R. S. Harrington *In* JPL Cometary Astrometry 15 Nov. 1984

p 93-95 (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

The general categories of catalogs are observed and compiled. Observed catalogs are tabulations of positions determined with a single instrument (transit circle or astrograph) at a single location with a single approximate mean epoch. Compiled catalogs are produced from a combination of observed catalogs and have the advantage of many more observations per star. In addition, catalogs may be classified according to their density and type of instrument used to produce them. The specific catalogs that should be used for Halley's Comet and Giacobini-Zinner Comet are described. B.G.

N85-25032*# Denver Univ., Colo.
OBTAINING ACCURATE COMET POSITIONS DESPITE SOME INACCURATE CATALOG STARS
E. Everhart *In* JPL Cometary Astrometry 15 Nov. 1984 p 96-98 ref (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

From an astrographic negative a grid is determined from measurement of all the reference stars and using their catalog positions, and other grids from selections of reference stars. These grids are determined from many stars, and individual stars will have errors with respect to the grid. There are ways to identify stars X that are not at their cataloged position: (1) determine the focal length of the telescope from the measurements of each pair of stars and look for discordant results; (2) stars X are several arcseconds off the grid, and the other stars fit better when stars X do not help determine the grid; and (3) the grid is stretched or distorted to include the stars X. Fifteen to twenty percent of the stars in the S.A.O. catalog are 1.5 seconds or more off their catalog positions. An interactive session with a computer can find and eliminate these errant stars and result in more accurate comet positions. B.G.

N85-25033*# Centro de Investigacion de Astronomia, Merida (Venezuela).
REDUCTION OF ASTROGRAPHIC CATALOGUES
J. Stock, F. Della Prugna, and J. Cova *In* JPL Cometary Astrometry 15 Nov. 1984 p 99-104 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

An automatic program for the reduction of overlapping Carte du Ciel plates is described. The projection and transformation equations are given and the RAA subprogram flow is outlined. The program was applied to two different sets of data, namely to nine overlapping plates of the Cape Zone of the CdC, and to fifteen plates taken with the CIDA-refractor of the open cluster Tr10. M.G.

N85-25034*# Lowell Observatory, Flagstaff, Ariz.
OCCULTATIONS OF STARS AND RADIO SOURCES BY COMETS: PREDICTIONS AND OBSERVING PROSPECTS
Edward Bowell, Lawrence H. Wasserman, William A. Baum, Robert L. Millis, and Kari Lumme (Helsinki Univ., Finland) *In* JPL Cometary Astrometry 15 Nov. 1984 p 105-122 refs (For primary document see N85-25015 14-89)
(Grants NsG-7603; NGR-03-003-001; NsG-7500)
Avail: NTIS HC A11/MF A01 CSCL 03A

The results that might stem from observations of occultations of stars and radio sources by cometary comae and ion tails are outlined. Taking account of the current orbital accuracy of P/Halley, specific predictions of stellar appulses with that comet, including preliminary topocentric circumstances, are presented. A crude model of the absorption of starlight by grains in a dusty comet supports the notion that stellar extinction may be observable in practice. Some thoughts on observing techniques are set down, discussing the merits of a two-dimensional detector (a CCD camera) and a conventional aperture photometer. The need for accurate photometric observations with time resolution approx. < 1 sec is stressed because the interval of greatest extinction will usually be brief. Finally, the efficacy of undertaking accurate relative astrometry of comets during predicted approaches to stars is explored. M.G.

N85-25035*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MEASURING: THE QUANTIFYING ART
James Gibson *In its* Cometary Astrometry 15 Nov. 1984 p 125-150 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03A

The photograph of a comet or asteroid against background stars contains information in analog form regarding the relative positions of comet and star images. Measuring is the procedure for covnerting this information to digital form for computation of the object's accurate equatorial coordinates at the time of observation. The use of one- and two-coordinate measuring engines to measure the positions of images which may be elongated, comatic, or both, as well as round images is discussed along with the training of novice measurers to cope with such images. The grading of plates for potential accuracy of positions, preparation of plates for measuring, the accuracy of measurement, effects of telescope focal length and reduction technique upon the accuracy of positions, and the procedures and checks which may prevent erroneous positions also are discussed. M.G.

N85-25036*# Naval Observatory, Washington, D.C.
LEAST SQUARES REDUCTION TECHNIQUE **c64**
R. S. Harrington *In* JPL Cometary Astrometry 15 Nov. 1984 p 151-153 ref (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 12A

An algorithm for implementing a standard least squares procedure on a small computer is presented for use in carrying out a plate reduction to obtain spherical coordinates for comets. A.R.H.

N85-25037*# Centro de Investigacion de Astronomia, Merida (Venezuela).
REDUCTION OF ASTROMETRIC PLATES **c64**
J. Stock *In* JPL Cometary Astrometry 15 Nov. 1984 p 154-159 ref (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 12A

A rapid and accurate method for the reduction of comet or asteroid plates is described. Projection equations, scale length correction, rotation of coordinates, linearization, the search for additional reference stars, and the final solution are examined. A.R.H.

N85-25038*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
COMETS AND NONGRAVITATIONAL FORCES **c91**
Brian G. Marsden *In* JPL Cometary Astrometry 15 Nov. 1984 p 163-166 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

The widely procedure used for the allowance of nongravitational effects in the motions of comets is summarized. Some results are mentioned, and an innovative variation of the procedure is discussed. Author

N85-25039*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ORBITS OF COMETS HALLEY AND GIOCOBINI-ZINNER **c90**
Donald K. Yeomans *In its* Cometary Astrometry 15 Nov. 1984 p 167-175 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

Ongoing activities to improve the orbits and ephemerides of comets Halley and Giacobini-Zinner are outlined. The nongravitational acceleration model of Marsden et al (1973) is used to represent the motion of these two comets over their observed intervals, and recent orbital updates are presented. Author

N85-25040*# Academy of Sciences (USSR), Moscow.
THE ORBITAL MOTION OF COMET HALLEY **c90**
V. V. Savchenko *In* JPL Cometary Astrometry 15 Nov. 1984 p 176-187 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

Since comet Halley is to be studied with spacecraft, new

requirements arise for the accuracy to which the position of the methodology of constructing an exact theory is presented. The effect of all kinds of errors in building a mathematical model of motion and the effect of a shift of Halley's center-of-mass relative to the optical center are analyzed. The theory is based on the optical, angular observations of 1911 back to 1759 reduced to the mean equator and epoch of 1950.0 as well as the relative observations of 1682. The observations of 1982 were used to control the accuracy of the theory developed. Deviations of calculated values from measured values do not exceed 1.5 which confirms the good degree of accuracy of this theory. The comet's orbit is obtained using current optical data. Author

N85-25041*# European Space Agency. European Space Operations Center, Darmstadt (West Germany).
THE WORK ON COMET HALLEY'S ORBIT AT ESOC **c90**
T. Morley and F. Hechlery *In* JPL Cometary Astrometry 15 Nov. 1984 p 188-202 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

The predominant error source in the final navigation for the Giotto Comet fly-by of Halley's nucleus is due to uncertainties in the comet's ephemeris. Efforts are being undertaken at ESOC to improve the prediction of the comet's state at the time of the encounter. Some of the aspects involved in the problem discussed include ways to improve old observations by re-measurement or re-reduction and encouragement to observers to take fine quality astrometric observations in the future, especially at critical times. Difficulties in the mathematical modelling of the non-gravitational forces and possible offsets of the comet's center-of-light from its center-of-mass are addressed. The available estimation techniques are also examined including one based upon selecting optimum observations. Author

N85-25042*# Polish Academy of Sciences, Warsaw. Space Research Center.
ON THE ORBIT IMPROVEMENT RESULTS OBTAINED BY REFERRING OLD COMETARY OBSERVATIONS TO THE SAO STAR CATALOG **c90**
M. Bielicki, G. Sitarski, and K. Ziolkowski *In* JPL Cometary Astrometry 15 Nov. 1984 p 203-206 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

An algorithm is presented for the automatic reduction to the SAO Star Catalog of old micrometer cometary observations of the type comet minus star. Results of a numerical test are presented showing the distinct influence of such a reduction on orbit determination results. Author

N85-25043*# Computer Sciences Corp., Silver Spring, Md.
ASTROMETRIC NEEDS FOR THE ISEE-3/ICE MISSION TO COMET GIOCOBINI-ZINNER
David W. Dunham *In* JPL Cometary Astrometry 15 Nov. 1984 p 207-213 refs (For primary document see N85-25015 14-89) (Contract NAS5-27888)
Avail: NTIS HC A11/MF A01 CSCL 03A

The Third International Sun-Earth Explorer satellite (ISEE-3) was rechristened Internation Cometary Explorer (ICE) when the spacecraft left the Earth-Moon system after a close Lunar flyby on 1983 December 22. On 1985 September 11, ICE will pass through the inner parts of the tail of Comet Giacobini-Zinner to obtain the first in-situ measurements of any comet. Since the spacecraft has no cameras, its trajectory will be determined only from radio tracking. Astrometric updates of Comet Giacobini-Zinner will be critical for the final targeting of the spacecraft to achieve a successful encounter. ICE's flyby of Comet Giacobini-Zinner will provide valuable experience for the astrometry needed to target other spacecraft to encounter Hally's Comet six months later. Author

N85-25044*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF THE OBSERVATION CONDITIONS OF CELESTIAL BODIES WITH THE AID OF THE DISPO SYSTEM
R. K. Kazakov and A. V. Krivov Dec. 1984 39 p refs Transl. into ENGLISH of "Opredeleniye Usloviy Nablyudeniya Nebesnykh Tel s Pomoshchyu Sistemy DISPO" Preprint 73 Moscow, 1984 p 1-37 Transl. by Scientific Translation Service, Santa Barbara, Calif.
Avail: NTIS HC A03/MF A01 CSCL 03A

The interactive system for determining the observation conditions of celestial bodies is described. A system of programs was created containing a part of the DISPO Display Interative System of Orbit Planning. The system was used for calculating the observatiion characteristics of Halley's comet during its approach to Earth in 1985-86. Author

N85-25045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE STELLAR SPECTROPHOTOMETRIC ATLAS, 3130 A < LAMBDA < 10800 A OF GUNN AND STRYKER (1983)
Wayne H. Warren, Jr. Nov. 1984 13 p ref
(NASA-TM-87437; NSSDC/WDC-A-R/S-83-02; NAS 1.15:87437)
Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the Atlas as it is currently being distributed from the Astronomical Data Center is described. The data were obtained with the Oke multichannel scanner on the 5-meter Hale reflector for purposes of synthesizing galaxy spectra, and the digitized Atlas contains normalized spectral energy distributions, computed colors, scan line and continuum indices for 175 selected stars covering the complete ranges of spectral type and luminosity class. The documentation includes a byte-by-byte format description, a table of the indigenous characteristics of the magnetic tape file, and a sample listing of logical records exactly as they are recorded on the tape. Author

N85-25046*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF A LIBRARY OF STELLAR SPECTRA (JACOBY, HUNTER AND CHRISTIAN 1984)
Wayne H. Warren, Jr. Nov. 1984 12 p ref
(NASA-TM-87438; NSSDC/WDC-A-R/S-84-11; NAS 1.15:87438)
Avail: NTIS HC A02/MF A01 CSCL 03A

The machine readable library as it is currently being distributed from the Astronomical Data Center is described. The library contains digital spectral for 161 stars of spectral classes O through M and luminosity classes 1, 3 and 5 in the wavelength range 3510 A to 7427 A. The resolution is approximately 4.5 A, while the typical photometric uncertainty of each resolution element is approximately 1 percent and broadband variations are < 3 percent. The documentation includes a format description, a table of the indigenous characteristics of the magnetic tape file, and a sample listing of logical records exactly as they are recorded on the tape. Author

N85-25047*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE REVISED S210 CATALOG OF FAR-ULTRAVIOLET OBJECTS (PAGE, CARRUTHERS AND HECKATHORN 1982)
Wayne H. Warren, Jr. Nov. 1984 18 p refs
(NASA-TM-87439; NSSDC/WDC-A-R/S-84-12; NAS 1.15:87439)
Avail: NTIS HC A02/MF A01 CSCL 03A

A detailed description of the machine-readable revised catalog as it is currently being distributed from the Astronomical Data Center is given. This catalog of star images was compiled from imagery obtained by the Naval Research Laboratory (NRL) Far-Ultraviolet Camera/Spectrograph (Experiments S201) operated from 21 to 23 April 1972 on the lunar surface during the Apollo 16 mission. The documentation includes a detailed data format description, a table of indigenous characteristics of the magnetic tape file, and a sample listing of data records exactly as they are presented in the machine-readable version. Author

N85-25048*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF A FINDING LIST FOR THE MULTIPLET TABLES OF NSRDS-NBS 3, SECTIONS 1-10 (ADELMAN, ADELMAN, FISCHEL AND WARREN 1984)
Wayne H. Warren, Jr. Dec. 1984 15 p refs
(NASA-TM-87440; NSSDC/WDC-A-R/S-84-14; NAS 1.15:87440) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable finding list, as it is currently being distributed from the Astronomical Data Center, is described. This version of the list supersedes an earlier one (1977) containing only Sections 1 through 7 of the NSRDS-NBS 3 multiplet tables publications. Additional sections are to be incorporated into this list as they are published. Author

N85-25049*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE CORDOBA DURCHMUSTERUNG (CD)
Wayne H. Warren, Jr. Dec. 1984 21 p refs
(NASA-TM-87441; NSSDC/WDC-A-R/S-84-15; NAS 1.15:87441) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the catalog, as it is currently being distributed from the Astronomical Data Center, is presented. The complete catalog is contained in the magnetic tape file, and corrections published in all corrigenda were made to the data. The machine version contains 613959 records, but only 613953 stars (six stars were later deleted, but their logical records are retained in the file so that the zone counts are not different from the published catalog). Author

N85-25050*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE CAPE PHOTOGRAPHIC DURCHMUSTERUNG (CPD)
Wayne H. Warren, Jr. Dec. 1984 15 p refs
(NASA-TM-87442; NSSDC/WDC-A-R/S-84-16; NAS 1.15:87442) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the catalog, as it is currently being distributed from the Astronomical Data Center, is described. The complete catalog is contained in the magnetic tape file, and corrections published in all errata have been made to the data. The machine version contains 454877 records, but only 454875 stars (two stars were later deleted, but their logical records are retained in the file so that the zone counts are not diiferent from the published catalog). Author

N85-25051*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE READABLE VERSION OF THE YALE CATALOGUE OF THE POSITIONS AND PROPER MOTIONS OF STARS BETWEEN DECLINATIONS -60 DEG AND -70 DEG (FALLON 1983)
Nancy G. Roman and Wayne H. Warren, Jr. Dec. 1984 14 p
(NASA-TM-87443; NSSDC/WDC-A-R/S-84-17; NAS 1.15:87443) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable, character-coded version of the catalog, as it is currently being distributed from the Astronomical Data Center(ADC), is described. The format and data provided in the magnetic tape version differ somewhat from those of the published catalog, which was also produced from a tape prepared at the ADC. The primary catalog data are positions and proper motions (equinox 1950.0) for 14597 stars. Author

N85-25052*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSPAS-SARSAT SATELLITE ORBIT PREDICTOR, VOLUME 5
Morton L. Friedman Apr. 1985 106 p 5 Vol.
(NASA-TM-85015-Vol-5; NAS 1.15:85015-Vol-5) Avail: NTIS HC A06/MF A01 CSCL 03A

A graphical aid for determining the relationship between the satellite (SARSAT or COSPAS) orbit, antenna coverage of the spacecraft, and coverage of the LUTs, the predictor allows the user to quickly visualize if a selected position will probably be detected. It is composed of a base map and a satellite track overlay for each satellite. A table of equator crossings for each satellite is included. Directions for using the predictor are given. A.R.H.

N85-25053# Arizona Univ., Tucson.
INVESTIGATIONS OF HIGH RESOLUTION IMAGING THROUGH THE EARTH'S ATMOSPHERE USING SPECKLE INTERFEROMETRY Final Report, 1 Feb. 1982 - 31 Jan. 1984
E. K. Hege, P. A. Strittmatter, and N. J. Woolf 7 Mar. 1984 124 p
(Contract F19628-82-K-0025)
(AD-A150680; AFGL-TR-84-0116) Avail: NTIS HC A06/MF A01 CSCL 03/1

Speckle interferometry is a post-detection image processing technique for producing diffraction limited data using large astronomical telescopes in the presence of Earth's turbulent atmosphere which otherwise limits the imaging resolution. The Steward Observatory digital video speckle interferometry system consists of subsystems for: (1) video digitization of intensified, magnified, focal-plane images, (2) Fourier transform (or autocorrelation) signal processing, and (3) image analysis to produce the final interpreted results. Speckle interferometry has now been shown capable of yielding diffraction images for objects as faint as visual magnitude 16. Objectives of present developments are to improve the resolution (by using the Multiple Mirror Telescope with its 6.9m optical aperture), the accuracy of the derived results (by implementing better photon detection and recording devices), and 4) the efficiency and speed of the reduction algorithms which extract the information (by means of high-speed digital signal-processing hardware). The work includes a growing effect in speckle image reconstruction using a combination of amplitude processing, various phase retrieval methods, holographic methods, and shift-and-add methods. The techniques have been applied to observations of Earth-orbiting satellites, asteroids, Pluto/Charon, binary stars, bright supergiant stars, active galactic nuclei, and quasi-stellar objects (QSOs). GRA

N85-23823*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LDR SYSTEM CONCEPTS AND TECHNOLOGY
Bruce Pittman *In* NASA. Langley Research Center Large Space Antenna Systems Technol., 1984 Apr. 1985 p 127-138 (For primary document see N85-23813 14-15)
Avail: NTIS HC A20/MF A01 CSCL 03A

N85-24787 Observatoire de Paris-Meudon (France).
MATERIALIZATION OF A REFERENCE SYSTEM VIA A STAR CATALOG [MATERIALISATION D'UN SYSTEME DE REFERENCE PAR UN CATALOG D'ETOILES]
Catherine Turon-Lacarrieu *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1149-1167 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-25054 Massachusetts Univ., Amherst.
THE STRUCTURE AND ANGULAR MOMENTUM CONTENT OF DARK CLOUDS Ph.D. Thesis
Richard Arquilla 1984 335 p
Avail: Univ. Microfilms Order No. DA8500052

A study was conducted of the structure, kinematics, and dynamics of eight dark clouds, with emphasis on the presence and influence of rotation. Rotation is confirmed in only three of six clouds previously reported to possess such motion, suggesting that rapid rotation in dark clouds is rarer than had been suspected.

One cloud (CRL 437) contains a bipolar flow, while the rotation model is in jepardy for B163 and B163SW due to apparent gross asymmetries in their mass distribution. Crude numerical results of sequential fragmentation theory can account for many inferred properties of globules, e.g., the correlation between cloud masses and specific angular momenta, and the reduction in average cloud angular momentum after several fragmentation epochs. Magnetic braking of cloud rotation is considered. Its importance for globule evolution is presently difficult to assess due to a paucity of observational constraints on field properties. It appears that fields are more likely to be important for cloud evolution if lateral field compression is delayed until a cloud's density has risen well above the ambient value. Author

N85-25055 Columbia Univ., New York.
NUMERICAL STUDY OF A TWO-FLUID HYDRODYNAMICAL MODEL OF INTERSTELLAR MEDIUM AND POPULATION 1 STARS Ph.D. Thesis
Wei-Hwan Chiang 1984 139 p
Avail: Univ. Microfilms Order No. DA8427366

A numerical study is presented of a hydrodynamic model for a system of stars and gas which are coupled in the following way: (1) stars form out of gas; (2) stars release gas; (3) stars heat up the gas; and (4) gas cools in the absence of heating. All simulations start with the unstable equilibrium solution, in which star formation is balanced by mass loss, heating balanced by cooling, and stars and gas have the same mean velocity. In all cases the gas evolves into a multi-component structure in an approximate pressure equilibrium, in which the most dilute component occupies a large fraction of the volume. This result is not in contradiction to the observed interstellar medium. In the two dimensional simulation, filament-condensation structures occur frequently. Many of their properties are similar to the observed filaments associated with the giant molecular complexes in Orion and in Monoceros. This suggests that large scale interactions studied here may be responsible for producing these features. Dissert. Abstr.

N85-25056*# California Inst. of Tech., Pasadena. Div. of Physics, Mathematics and Astronomy.
THE FEINHEIT METHOD: A PHASE-INDEPENDENT FORMULATION OF THE PERIOD-LUMINOSITY RELATION FOR CEPHIDS
Barry F. Madore 25 Feb. 1985 23 p refs
(NASA-CR-175708; NAS 1.26:175708) Avail: NTIS HC A02/MF A01 CSCL 03B

The tight correlation between color and luminosity during the cyclical variation of a Cepheid is calibrated and shown to be a direct means by which most of the phase-dependent temperature-induced amplitude of the variable can be transformed away. The resulting Feinheit function, F = V - alpha (B-V) gives rise to a random-phase period-luminosity relation with an rms scatter of less than 0.20 mag. A comparison shows that the blue Feinheit method for distance determinations method from single-phase observations is as accurate as near-infrared photometry but has the added advantage of being able to use panoramic detectors for the data acquisition. The Feinheit function is identified as the surface area variation of the Cepheid during its cycle. Author

N85-24762 Centre National d'Etudes Spatiales, Toulouse (France).
ELEMENTS OF CELESTIAL MECHANICS [ELEMENTS DE MECANIQUE CELESTE]
Francois Nouel *In its* Space Math. for the Prepn. and Develop. of Satellite Exploit. 1984 p 231-266 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-24782 Bureau des Longitudes, Paris (France).
THE SOLAR SYSTEM: IMPROVING KNOWLEDGE OF THE SYSTEM [LE SYSTEME SOLAIRE: AMELIORATION DE LA CONNAISSANCE DU SYSTEME]
B. Morando *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1039-1049 refs In FRENCH (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-25039*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ORBITS OF COMETS HALLEY AND GIOCOBINI-ZINNER
Donald K. Yeomans *In its* Cometary Astrometry 15 Nov. 1984 p 167-175 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

N85-25040*# Academy of Sciences (USSR), Moscow.
THE ORBITAL MOTION OF COMET HALLEY
V. V. Savchenko *In* JPL Cometary Astrometry 15 Nov. 1984 p 176-187 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

N85-25041*# European Space Agency. European Space Operations Center, Darmstadt (West Germany).
THE WORK ON COMET HALLEY'S ORBIT AT ESOC
T. Morley and F. Hechlery *In* JPL Cometary Astrometry 15 Nov. 1984 p 188-202 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

N85-25042*# Polish Academy of Sciences, Warsaw. Space Research Center.
ON THE ORBIT IMPROVEMENT RESULTS OBTAINED BY REFERRING OLD COMETARY OBSERVATIONS TO THE SAO STAR CATALOG
M. Bielicki, G. Sitarski, and K. Ziolkowski *In* JPL Cometary Astrometry 15 Nov. 1984 p 203-206 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N85-25057*# Texas Univ. at Dallas, Richardson.
INVESTIGATION OF THE DAYTIME LUNAR ATMOSPHERE Final Report
R. Richard Hodges, Jr. 27 Mar. 1985 27 p refs
(Grant NsG-7034)
(NASA-CR-175636; NAS 1.26:175636) Avail: NTIS HC A03/MF A01 CSCL 03B

Lunar atmosphere research has tended to center on gases with predictably large sources and on those which have been identified by Apollo experiments. An early candidate atmospheric constituent was Ar 40 which was noted by Heyman and Yaniv to have a surface correlated component in returned soil samples, and an abundance in excess of what can be explained by potassium decay. The source of the excess argon was attributed to atmospheric argon ions which have been accelerated by solar wind fields and implanted in soil grains. G.L.C.

N85-25058*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
EXTENDED ATMOSPHERES OF OUTER PLANET SATELLITES AND COMETS Interim Report, Feb. - Apr. 1985
William H. Smyth and Michael R. Combi Apr. 1985 10 p refs
(Contract NASw-3966)
(NASA-CR-175673; NAS 1.26:175673) Avail: NTIS HC A02/MF A01 CSCL 03B

Collisions between neutral hydrogen atoms in the interstellar medium and those in the so-called Titan hydrogen torus may provide an additional lifetime sink for atoms in the Saturn environment. Progress toward re-sorting the Voyager UVS scans of neutral hydrogen in the Saturn system to enable both a factor

of two increase in the amount of data to be analyzed as well as to help identify near-Titan hydrogen is discussed. Progress toward development of the cometary carbon and oxygen models is also discussed and a preliminary model run for the H2O source of cometary oxygen is presented. Author

N85-24783 European Space Agency. European Space Operations Center, Darmstadt (West Germany).
TOWARDS THE HALLEY COMET
G. Janin *In* CNES Space Math. for the Prepn. and the Develop. of Satellite Exploit. 1984 p 1051-1071 refs (For primary document see N85-24753 14-59)
Avail: CEPADUES, Toulouse, France

N85-25017*# Remeis Sternwarte, Bamberg (West Germany).
CURRENT IDEAS ON THE NATURE OF COMETS
Juergen Rahe *In* JPL Cometary Astrometry 15 Nov. 1984 p 7-13 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

N85-25018*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEAR-NUCLEUS STUDIES OF COMET HALLEY
Stephen Larson (Arizona Univ., Tucson) and Zdenek Sekanina *In* JPL Cometary Astrometry 15 Nov. 1984 p 14-20 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

N85-25038*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
COMETS AND NONGRAVITATIONAL FORCES
Brian G. Marsden *In* JPL Cometary Astrometry 15 Nov. 1984 p 163-166 refs (For primary document see N85-25015 14-89)
Avail: NTIS HC A11/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-25059 Columbia Univ., New York.
X-RAY POLARIMETRY: THE MEASUREMENT OF THE POLARIZATION OF SOLAR FLARE X-RAYS AND THE DESIGN OF A COMPTON POLARIMETER Ph.D. Thesis
Leonard Jacob Tramiel 1984 147 p
Avail: Univ. Microfilms Order No. DA8427487

A Compton polarimeter was designed for use in X-ray astrophysics. This device utilizes the anisotropic Compton scattering of polarized X-rays to determine their polarization, and incorporates an intrinsic coincidence rejection scheme to reduce the non-X-ray background. The Compton polarimeter is sensitive to X-rays from 30 to 100 kiloelectronvolts. Another class of X-ray polarimeter, the photoelectric polarimeter, is discussed. This class of devices detects the anisotropic distribution of photoelectrons ejected by polarized X-rays. The energy range for this instrument is 5 to 100 kiloelectronvolts. An analysis of electron scattering, a complicating effect for these devices, is presented which indicates a severe limitation on the utility of photoelectric polarimeters. This theoretical work is reconciled with the previous experiments. One implementation, using an imaging proportional counter, was tested in the laboratory. No polarization effects were seen. Dissert. Abstr.

N85-25060*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR SEISMOLOGY FROM SPACE. A CONFERENCE AT SNOWMASS, COLORADO
R. K. Ulrich, J. Harvey, E. J. Rhodes, Jr., and J. Toomre 15 Dec. 1984 384 p refs Conf. held in Snowmass, Colo., 17-19 Aug. 1983
(Contract NAS7-918)
(NASA-CR-175661; JPL-Pub-84-84; NAS 1.26:175661) Avail: NTIS HC A17/MF A01 CSCL 03B

The quality of the ground based observing environment suffers from several degrading factors: diurnal interruptions and thermal variations, atmospheric seeing and transparency fluctuations and adverse weather interruptions are among the chief difficulties. The limited fraction of the solar surface observable from only one vantage point is also a potential limitation to the quality of the data available without going to space. Primary conference goals were to discuss in depth the scientific return from current observations and analyses of solar oscillations, to discuss the instrumental and site requirements for realizing the full potential of the seismic analysis method, and to help bring new workers into the field by collecting and summarizing the key background theory. At the conclusion of the conference there was a clear consensus that ground based observation would not be able to provide data of the quality required to permit a substantial analysis of the solar convection zone dynamics or to permit a full deduction of the solar interior structure. For individual titles, see N85-25061 through N85-25089.

N85-25061*# Joint Inst. for Lab. Astrophysics, Boulder, Colo. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
OVERVIEW OF SOLAR SEISMOLOGY: OSCILLATIONS AS PROBES OF INTERNAL STRUCTURE AND DYNAMICS IN THE SUN
Juri Toomre *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 7-39 refs (For primary document see N85-25060 14-92)
(Grants NsG-7511; NAGw-91; Contract F19628-82-K-0008)
Avail: NTIS HC A17/MF A01 CSCL 03B

The physical nature of solar oscillations is reviewed. The nomenclature of the subject and the techniques used to interpret the oscillations are discussed. Many of the acoustic and gravity waves that can be observed in the atmosphere of the Sun are actually resonant or standing modes of the interior; precise measurements of the frequencies of such modes allow deductions of the internal structure and dynamics of this star. The scientific objectives of such studies of solar seismic disturbances, or of solar seismology, are outlined. The reasons why it would be very beneficial to carry out further observations of solar oscillations both from ground based networks and from space will be discussed. Author

N85-25062*# High Altitude Observatory, Boulder, Colo.
WHAT WOULD A DYNAMO THEORIST LIKE TO KNOW ABOUT THE DYNAMICS OF THE SOLAR CONVECTION ZONE?
Peter A. Gilman *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 41-48 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Observations about the current status of solar dynamo theory are given. The induction equation for magnetic field is solved using assumed velocities and parametric representations of the inductive or diffusive effects of velocities. The equations of motion governing these flow are not solved in parallel. Results from global compressible convection models are discussed. Differential rotation and convection are also investigated. E.R.

N85-25063*# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
SOLAR INVERSE THEORY
Douglas Gough *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 49-78 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Helioseismological inversion, as with the inversion of any other data, is divided into three phases. The first is the solution of the so-called forward problem: namely, the calculation of the eigenfrequencies of a theoretical equilibrium state. The second is an attempt to understand the results, either empirically by determining how those frequencies vary as chosen parameters defining the equilibrium model are varied, or analytically from asymptotic expansions in limiting cases of high order or degree. The third phase is to pose and solve an inverse problem, which seeks to find a plausible equilibrium model of the Sun whose eigenfrequencies are consistent with observation. The three phases

are briefly discussed in this review, and the third, which is not yet widely used in helioseismology, is illustrated with some selected inversions of artificial solar data. Author

N85-25064*# High Altitude Observatory, Boulder, Colo.
ROTATIONAL INVERSION FROM GLOBAL SOLAR OSCILLATIONS
Joergen Christensen-Dalsgaard and Douglas Gough *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 79-93 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The degree to which various sets of solar oscillations can resolve the solar internal rotation was investigated. Genuine observations were simulated by the following procedure; first an artificial angular velocity was invented, and from it the rotational splitting of a set of normal modes was calculated; to that was added some random noise. The result was treated as artificial data and an attempt to recover the rotation law by using the Backus-Gilbert optimal averaging procedure was made. Neither the original rotation law nor the amount of noise that had been added was known. The conclusion was compared with the actual artificial angular velocity. Author

N85-25065*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
SENSITIVITY OF INFERRED SUBPHOTOSPHERIC VELOCITY FIELD TO MODE SELECTION, ANALYSIS TECHNIQUE AND NOISE
Frank Hill, Douglas Gough (Cambridge Univ., England), and Juri Toomre (Colorado Univ., Boulder) *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 95-111 refs Sponsored in part by UK Science and Engineering Research Council (For primary document see N85-25060 14-92)
(Grants NsG-7511; NAGw-91; NSF AST-78-17292; Contract F19628-83-K-0008)
Avail: NTIS HC A17/MF A01 CSCL 03B

The horizontal velocity immediately below the photosphere was inferred from observations of high degree solar oscillations by an optimal averaging inversion technique. The sensitivity of the results to various details of both the inversion and the determination of the frequencies are investigated. The results are shown to be quite stable to the choice of most parameters, suggesting that this procedure produces reliable estimates of the subsurface velocity. Author

N85-25066*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE MAGNETO-OPTICAL FILTER, WORKING PRINCIPLES AND RECENT PROGRESS
A. Cacciani (Rome Univ., Italy) and E. J. Rhodes, Jr. *In its* Solar Seismology from Space. 15 Dec. 1984 p 115-123 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The Magneto-Optical Filter is described which allows simultaneous magnetic and velocity measurements (in both imaging and non-imaging modes) without the need for a spectrograph. In this way the stability and alignment problems of the spectrograph are completely overcome. Its major advantages are: wavelength absolute reference and stability, high signal to noise ratio and independence of the transmission profile from the incidence angle of the solar beam. It is an imaging instrument allowing high wave number analysis in the solar oscillation spectrum and a continuous monitoring of the image position through the chromospheric facular structures. The apparatus in use at Mt. Wilson is assembled in a modular form. The most important part of it is a glass cell containing the sodium vapor. The filter is easy to use but the cell is not easy to construct in an optimal way. The technology is in progress both to use Na and K together and to prevent the windows from becoming coated during a long-term operation. Author

N85-25067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF A MAGNETO-OPTICAL FILTER AND A FABRY-PEROT INTERFEROMETER FOR THE MEASUREMENT OF SOLAR VELOCITY FIELDS FROM SPACE
Edward J. Rhodes, Jr., Alessandro Cacciani (Rome Univ., Italy), Jacques Blamont, Steven Tomczyk (California Univ. at Los Angeles), Roger K. Ulrich (California Univ. at Los Angeles), and Robert F. Howard (Mount Wilson Observatory) *In its* Solar Seismology from Space. 15 Dec. 1984 p 125-155 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

A program was developed to evaluate the performance of three different devices as possible space-borne solar velocity field imagers. Two of these three devices, a magneto-optical filter and a molecular adherence Fabry-Perot interferometer were installed in a newly-constructed observing system located at the 60-foot tower telescope at the Mt. Wilson Observatory. Time series of solar filtergrams and Dopplergrams lasting up to 10 hours per day were obtained with the filter while shorter runs were obtained with the Fabry-Perot. Two-dimensional k (sub h)-omega power spectra which show clearly the well-known p-mode ridges were computed from the time series obtained with the magneto-optical filter. These power spectra were compared with similar power spectra obtained recently with the 13.7-m McMath spectrograph at Kitt Peak. B.W.

N85-25068*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
THE FOURIER TACHOMETER 2: AN INSTRUMENT FOR MEASURING GLOBAL SOLAR VELOCITY FIELDS
Timothy M. Brown *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 157-163 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The High Altitude Observatory and Sacramento Peak Observatory have jointly constructed a second version of the Fourier Tachometer, which is now undergoing final integration and testing. This is an interferometric instrument for measuring the Doppler shift of solar spectrum lines. The principal features and performance goals of this instrument are: simultaneous velocity observations over a 2-dimensional, 100 x 100 pixel field of view; measurement of absolute Doppler shifts with 1 m/s accuracy; noise level for moderate-1 oscillation modes of 1 cm/s for a 1-day observing run; flexibility and ease of use. Early (though incomplete) testing suggests that these goals should be attainable with the current instrument. Author

N85-25069*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF INTERMEDIATE-DEGREE SOLAR OSCILLATIONS
J. W. Harvey and T. L. Duvall, Jr. *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 165-172 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

A progress report on observations of intermediate degree oscillations is presented. Frequencies of zonal p-mode oscillations with amplitudes in excess of approx are found. 2 cm/s. These frequencies show systematic disagreement with recent theoretical calculations. The frequencies with asymptotic formula estimates are examined. Small scatter is obtained for low degree modes but large scatter at large degree. A first look at sectoral harmonic observations shows that magnetic active regions provide a major signal at low frequencies. B.W.

N85-25070*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
DETECTION OF SOLAR GRAVITY MODE OSCILLATIONS
Philip H. Scherrer *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 173-182 refs Sponsored in part by the Max C. Fleischmann Foundation (For primary document see N85-25060 14-92)
(Contract NAS5-24420; Grant NGR-05-020-559; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
Avail: NTIS HC A17/MF A01 CSCL 03B

An analysis of solar velocity data obtained at the Stanford Solar Observatory has shown the existence of solar global oscillations. The oscillations are in the range 45 to 105 micro Hz

(160 to 370 minutes) and are interpreted as internal gravity modes of degree l=1 and l=2. Author

N85-25071*# Physikalisch-Meteorologisches Observatorium, Davos (Switzerland).
SOLAR GRAVITY MODES FROM ACRIM-SWM IRRADIANCE DATA
Claus Frohlich and Philippe Delache *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 183-193 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The record of 280 days of continuous data of the ACRIM radiometer on board the Solar Maximum Mission satellite is analyzed in the frequency range from 10 to 80 micro Hz. Gravity modes of degree one and two with orders from about 10 to several hundreds can be localized. A statistical method to determine the fundamental period T sub 0 and the rate of rotation upsilon sub R as seen by rotational splitting is described and the results for 33.5 < T sub 0 < 45.5 minutes and 0.4 < upsilon sub R < micro Hz are presented. They indicate a rather high T sub 0 and it cannot be excluded that it is above the upper limit analyzed. Author

N85-25072*# California Univ., La Jolla. Center for Astrophysics and Space Sciences.
OBSERVATIONS OF LOW-DEGREE MODES FROM THE SOLAR MAXIMUM MISSION (EXTENDED ABSTRACT) Abstract Only
Martin Woodard *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 195-197 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Mean frequencies, amplitudes, and linewidths for the solar 5 min p mode oscillations of degree 0, 1, and 2 have been obtained from approx. 280 days of SMM-ACRIM total irradiance data. The frequencies are in good agreement with measurements obtained from velocity data. The amplitudes of the modes lie along a well defined envelope of power vs. frequency, which peaks at 3.1 mHz and has a width of 0.7 mHz (FWHM). The r.m.s. amplitude of the highest peak in the spectrum (n=21, l=1) is approx. 3 ppm of the total flux. The linewidths of the narrowest l=O modes are approx. 1 micro Hz (FWHM). A broad continuum of power caused both by solar surface granulation and by instrumental noise interferes with the analysis of 5 min modes. The continuum spectral power in a 1 micro Hz band near 3 mHz corresponds to an apparent r.m.s. variation of approx. 0.5 parts per million of the mean solar flux. Author

N85-25073*# High Altitude Observatory, Boulder, Colo.
IMPLICATIONS OF OBSERVED FREQUENCIES OF SOLAR P MODES
Joergen Christensen-Dalsgaard and Douglas Gough (Cambridge Univ., England) *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 199-204 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

A preliminary comparison is made of the observed frequencies of 5 min P modes with theoretical frequencies for a traditional solar model. The differences between observations and theory can be understood qualitatively in terms of two separate sources of error in the frequency calculation, one near the solar surface and the other at the base of the convection zone. There is no indication of errors in the deep interior of the model. B.W.

N85-25074*# Arizona Univ., Tucson. Dept. of Physics.
OBSERVED SPATIAL PROPERTIES OF THE SOLAR EIGENFUNCTIONS AND THE IMPLICATIONS FOR THE EXISTENCE OF RESOLVED MULTIFLETS
Thomas P. Caudell, Henry A. Hill, and Randall J. Bos *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 207-217 refs Sponsored in part by NSF and AF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Solar oscillations are manifested in the solar atmosphere as spatial and temporal perturbations in the local thermodynamical and mechanical properties. When measuring the solar radius/diameter, these perturbations enter the observation through changes in the radiative source function and opacity at the extreme limb. When compared to the disk center, the observable portion of these perturbations is changed in spatial character by projection effects and oblique optical depth geometry. The time varying solar radius signal at SCLERA (Santa Catalina Laboratory for Experimental Relativity) is produced by an edge definition sensitive to the resultant changes in the spatial shape of the limb intensity profile. An attempt is made to further determine the shape and properties of the limb signals which display global solar oscillations. B.W.

N85-25075*# High Altitude Observatory, Boulder, Colo.
OPTIMIZED RESPONSE FUNCTIONS FOR 2-DIMENSIONAL OBSERVATIONS OF SOLAR OSCILLATIONS
Joergen Christensen-Dalsgaard *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 219-253 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Response functions are calculated for solar oscillation observations made in Doppler velocity which is averaged over a grid of 30' x 30' pixels. In a simulation of an analysis scheme proposed for the HAO/SPO Fourier Tachometer the responses for the individual pixels are combined using Chebychev weighting functions. It is shown how a technique developed for geophysical inversion may be used to find linear combinations concentrated within a fairly narrow range of l and m values of these transformed responses. The extension to bidirectional observations is discussed. E.A.K.

N85-25076*# Association of Universities for Research, Tucson, Ariz.
THE EFFECTS OF IMAGE MOTION ON THE l-nu DIAGRAM
Frank Hill *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 255-262 refs (For primary document see N85-25060 14-92) (Grants NsG-7511; NAGw-91; ; Contracts F19628-77-C-0104; F19628-83-K-0008; Grant NSF AST-78-17292)
Avail: NTIS HC A17/MF A01 CSCL 03B

A simple two dimensional (x,t) model of the solar oscillatory velocity field is subjected to a form of differential image motion. This image motion is meant to approximately model the effect of the Earth's atmosphere on observations of high degree solar oscillations. The distorted velocity field is analyzed to provide the apparent frequencies of the modes. It is shown that the image motion can produce a discrepancy of as much as 12 micro Hz. E.A.K.

N85-25077*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF SEEING ON NOISE
Roger K. Ulrich (California Univ., Los Angeles), Edward J. Rhodes, Jr., Alessandro Cacciani (Rome Univ., Italy), and Steven Tomczyk (California Univ., Los Angeles) *In its* Solar Seismology from Space. 5 Dec. 1985 p 263-270 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The effect of the supergranulation velocity field combined with seeing smearing of the solar image on the measurement of solar oscillations is discussed. Depending on the nature of the observational velocity determination scheme, the image motions can shift the background velocity pattern and produce a source of noise that reduces the quality of the observations. The magnitude of this effect is estimated and observational results which are consistent with this estimate are presented. E.A.K.

N85-25078*# Association of Universities for Research, Tucson, Ariz.
THE EFFECTS OF A NEARLY 100% DUTY CYCLE IN OBSERVATIONS OF SOLAR OSCILLATIONS
Frank Hill *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 271-277 refs (For primary document see N85-25060 14-92) (Grants NsG-7511; NAGw-91; ; Contracts F19628-77-C-0104;

F19638-83-K-008; Grant NSF AST-78-17292)
Avail: NTIS HC A17/MF A01 CSCL 03B

Power spectra of window functions with duty cycles between 80% and 99% and with randomly spaced gaps are compared and their effect on observations of solar oscillations are discussed. It is found that for all the cases, observations of solar oscillations would not be severely impacted as long as the gap structure is random rather than periodic. E.A.K.

N85-25079*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS AND INTERPRETATION OF SYNTHETIC TIME STRINGS OF OSCILLATION DATA
Barbara W. Mihalas, Joregen Christensen-Dalsgaard, and Timothy M. Brown *In its* Solar Seismology from Space. 15 Dec. 1984 p 279-292 refs Sponsored in part by NSF (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Artificial strings of solar oscillation data with gaps and noise, corresponding to the output of different spatial filter functions, were analyzed. Peaks in the power spectrum are identified for values of the degree l from 0 to 18, and rotational splitting is estimated. The filters prove effective in facilitating identification of essentially all the real peaks in the power spectrum. Estimates of peak frequencies and amplitudes and rotational splitting frequencies are in reasonably good agreement with the input values. Spurious peaks in autocorrelation spectra correspond to the frequency spacing between power peaks with the same order n, differing by one or two in the degree l. E.A.K.

N85-25080*# Princeton Univ., N. J. Dept. of Physics.
SPECTRAL INFORMATION FROM GAPPED DATA. A COMPARISON OF TECHNIQUE
J. R. Kuhn *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 293-303 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The fast Fourier transformations (FFT) is used to estimate power spectra of continuous signals evenly sampled on discrete domains. The problem of finding power spectra on unevenly sampled domains, in particular a regularly spaced domain with gaps is discussed. The analysis of the ACRIM solar bolometric intensity data, obtained with a 3/5 on and 2/5 off duty cycle of approximately 100 minutes, would benefit from the techniques. The comparative effectiveness of three different analysis techniques applied to synthetic data generated on gapped domain is reported. E.A.K.

N85-25081*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
METHODS FOR CLOUD COVER ESTIMATION
David L. Glackin, James R. Huning, Jeffrey H. Smith, and Thomas L. Logan *In its* Solar Seismology from Space. 15 Dec. 1984 p 305-312 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Several methods for cloud cover estimation are described relevant to assessing the performance of a ground-based network of solar observatories. The methods rely on ground and satellite data sources and provide meteorological or climatological information. One means of acquiring long-term observations of solar oscillations is the establishment of a ground-based network of solar observatories. Criteria for station site selection are: gross cloudiness, accurate transparency information, and seeing. Alternative methods for computing this duty cycle are discussed. The cycle, or alternatively a time history of solar visibility from the network, can then be input to a model to determine the effect of duty cycle on derived solar seismology parameters. Cloudiness from space is studied to examine various means by which the duty cycle might be computed. Cloudiness, and to some extent transparency, can potentially be estimated from satellite data. Author

N85-25082*# Los Alamos Scientific Lab., N. Mex.
NUMERICAL SIMULATIONS OF CONVECTIVELY EXCITED GRAVITY WAVES
Gary A. Glatzmaier *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 315-324 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

Magneto-convection and gravity waves are numerically simulated with a nonlinear, three-dimensional, time-dependent model of a stratified, rotating, spherical fluid shell heated from below. A Solar-like reference state is specified while global velocity, magnetic field, and thermodynamic perturbations are computed from the anelastic magnetohydrodynamic equations. Convective overshooting from the upper (superadiabatic) part of the shell excites gravity waves in the lower (subadiabatic) part. Due to differential rotation and Coriolis forces, convective cell patterns propagate eastward with a latitudinally dependent phase velocity. The structure of the excited wave motions in the stable region is more time-dependent than of the convective motions above. The magnetic field tends to be concentrated over giant-cell downdrafts in the convective zone but is affected very little by the wave motion in the stable region. Author

N85-25083*# Sacramento Peak Observatory, Sunspot, N. Mex.
ON THE INFLUENCE OF TURBULENT MOTIONS ON NON-RADIAL OSCILLATIONS
B. R. Durney *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 325-334 refs (For primary document see N85-25060 14-92)
(NASA Order W-15076; Grant NSF AST-78-17292)
Avail: NTIS HC A17/MF A01 CSCL 03B

The effect of turbulent motions on oscillations is studied, considering only the coupling between turbulent and oscillatory velocities. In this case, the turbulence affects the oscillations through the Reynolds stresses in the momentum equation for the pulsations. A simple model of turbulence is adopted to evaluate these Reynolds stresses and the perturbed eigenfrequencies are expressed as a function of certain averages of the turbulent velocities. Author

N85-25084*# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
THE STABILITY OF THE LOW-DEGREE 5-MINUTE SOLAR OSCILLATIONS
Russell B. Kidman and Arthur N. Cox *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 335-343 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The decay rate for many of the low degree p modes observed as 5 minute oscillations of the Sun is discussed and decay rates for modes ranging from radial (l=0) to the nonradial ones with l=5 for overtones 10 through 28. Parameters needed for he solar model are given and the hydrogen mass fraction composition structure is shown as well as the structure given by Christensen-Dalsgaard (1982) for an evolved solar model. The special equation of state and opacity table with X=0.74 for the hydrogen mass fraction in the outer 0.40 of the mass needs slightly more hydrogen in the central regions than obtained by Christensen-Dalsgaard in order to give a complete and consistent model. The difference in helium production between these two models is about 10%, meaning that the total energy radiated by the Sun during its lifetime thus far agrees satisfactorily with accurately calculated evolution sequences. A.R.H.

N85-25085*# Tata Inst. of Fundamental Research, Bombay (India).
AN EXCITATION MECHANISM FOR SOLAR 5-MINUTE OSCILLATION OF INTERMEDIATE AND HIGH DEGREE
H. M. Antia, S. M. Chitre, and D. Narasimha *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 345-348 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The overstability of acoustic modes trapped in the solar convection zone is studied with mechanical and thermal effects of turbulence included, in an approximate manner, through the eddy transport coefficients. Many of these acoustic modes are

found to be overstable with the most rapidly growing modes occupying a region centered around 3.2 mHz and spread over a wide range of length-scales. The numerical results are in reasonable accord with the observed power-spectrum of the five-minute oscillations of intermediate and high degree. The oscillations are probably driven by a simultaneous operation of the kappa-mechanism and the turbulent conduction (convective Cowling) mechanism, the dominant contribution to the generation of self-excited acoustic waves arising from the convective Cowling mechanism. A.R.H.

N85-25086*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RESONANT COUNT DIAGRAM AND SOLAR g MODE OSCILLATIONS
D. B. Guenther (Yale Univ. Observatory) and P. Demarque *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 349-350 refs (For primary document see N85-25060 14-92)
(Grant NSF AST-80-23743)
Avail: NTIS HC A17/MF A01 CSCL 03B

Evidence is provided to support the hypothesis that, because of the particular frequency separations of the solar g modes, resonant three-wave interactions stimulate only a selected few g modes. A resonant count diagram was obtained by plotting the total number of possible resonant three-wave interactions or a given beat frequency against the inverse of the beat frequency (the beat period), within a given frequency tolerance. The 1 = 1, 2, 3, 4 g modes calculated by Christensen-Dalsgaard, Gough and Morgan (1979) for a standard model of the Sun were used. The diagram has a significant peak at 160 minutes as well as other peaks at longer periods. The g modes that Delache and Scherrer (1983) tentatively identified from the Crimea-Stanford data were also plotted. These modes were found to correspond with the other peaks in the diagram. This coincidence between the observed g modes and the peaks in the resonant count diagram suggest that the observed g modes do owe their observability to resonant three-wave interactions. A.R.H.

N85-25087*# Arizona Univ., Tucson.
FINE STRUCTURE OF SOLAR ACOUSTIC OSCILLATIONS DUE TO ROTATION
Philip R. Goode and W. Dziembowski (Polish Acad. of Sci., Warsaw) *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 351-355 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The nature of the fine structure of high order, low degree five minute period solar oscillations following from various postulated forms of spherical rotation is predicted. The first and second order effects of rotation are included. A.R.H.

N85-25088*# California Univ., Livermore. Lawrence Livermore Lab.
IONIZATION EQUILIBRIUM AND EQUATION OF STATE IN THE SOLAR INTERIOR
Forrest J. Rogers *In* JPL Solar Seismology from Space. 15 Dec. 1984 p 357-370 refs (For primary document see N85-25060 14-92)
(Contract W-7405-eng-48)
Avail: NTIS HC A17/MF A01 CSCL 03B

Many-body formulations of the equations of state are restated as a set of Saha-like equations. It is shown that the resulting equations are unique and convergent. These equations are similar to the usual Saha equations to the order of the Debye-Huckel theory. Higher order corrections, however, require a more general formulation. It is demonstrated that the positive free energy resulting from the interaction of unscreened particles in high orbits depletes the occupation of these states, without the introduction of shifted energy levels. Author

N85-25089*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SENSITIVITY OF SOLAR EIGENFREQUENCIES TO THE TREATMENT OF THE EQUATION OF STATE
Roger K. Ulrich (California Univ., Los Angeles) and Edward J. Rhodes, Jr. *In its* Solar Seismology from Space. 15 Dec. 1984 p 371-377 refs (For primary document see N85-25060 14-92)
Avail: NTIS HC A17/MF A01 CSCL 03B

The principal uncertainties in the equation of state involve the treatment of pressure ionization, the Debye-Huckel coulomb corrections, and the treatment of many-particle interaction effects. It is found that, for the lowest degree modes (l between 0 and 3), the terms and procedures used in the equation of state which deal with these uncertainties introduce changes in the frequencies which are less than 4 micro Hz. Recently, Shibahashi, Noels and Gabriel (1983) published solar eigenfrequencies using a theory with an equation of state improved with respect to the theory used earlier by Shibahashi and Osaki (1981). Their comparison between the two sets of results suggested that uncertainties in the frequencies as large as 10 micro Hz could be caused by the equation of state. It is felt that since the entire effect of the uncertain terms is only 4 micro Hz and since the uncertainties are only a fraction of each term, the 10 micro Hz changes found by Shibahashi et al must be a consequence of differences between the earlier and later calculations in areas other than the equation of state. Author

N85-25090# Los Alamos Scientific Lab., N. Mex.
MOLYBDENUM SOLAR NEUTRINO EXPERIMENT
K. Wolfsberg, G. A. Cowan, E. A. Bryant, K. S. Daniels, S. W. Downey, W. C. Haxton, V. G. Niesen, N. S. Nogar, C. M. Miller, and D. J. Rokop 1984 8 p refs Presented at the Conf. on Solar Neutrinos and Neutrino Astron., Lead, S.D., 23-25 Aug. 1984
(Contract W-7405-eng-36)
(DE85-003747; LA-UR-84-3566; CONF-8408132) Avail: NTIS HC A02/MF A01

The molybdenum solar neutrino experiment goal is to deduce the (8)B solar neutrino flux, averaged over the past several million years, from the concentration of (98)Tc in a deeply buried molybdenum deposit. It is important because it will shed light on the reason for the discrepancy between theory and observation of the chlorine solar neutrino experiment. It is suggested that possible reasons for the discrepancy lie in the properties of neutrinos or in deficiencies of the standard solar model. The chlorine experiment only measures the (8)B neutrino flux in current times. In the molybdenum experiments, (98)Tc (4.2 Myr) are measured, which are produced by (8)B neutrinos, and possibly (97)Tc (2.6 Myr), produced by lower energy neutrinos. DOE

N85-25091# European Space Agency, Paris (France).
THE HYDROMAGNETICS OF THE SUN
T. D. Guyenne, comp. and J. J. Hunt, comp. Nov. 1984 308 p refs Proc. of 4th European Meeting on Solar Phys., Noordwijkerhout, Neth,, 1-3 Oct. 1984; sponsored by Royal Netherlands Acad. of Arts and Sci. ESA, Utrecht Univ., Utrecht Lab. for Space Res. and Leiden Kerkhoven-Bosscha Found.; organized by European Phys. Society, Obs. Sonnenborgh, Utrecht and Utrecht Lab. for Space Res.
(ESA-SP-220; ISSN-0379-6566) Avail: NTIS HC A14/MF A01

The overall structure of the Sun, solar magnetic fields, and the corona are reviewed. Radial variation of solar density and angular rotational velocity; internal mixing in the Sun; solar granulation; magnetic convection; umbral oscillations in sunspots; solar cycle variations; magnetic flux tubes; dynamo theory; coronal heating; coronal mass ejection; and solar activity are covered. For individual titles, see N85-25092 through N85-25162.

N85-25092# Nordisk Institut for Teoretisk Atomfysik, Copenhagen (Denmark).
SOLAR OSCILLATIONS
J. Christensen-Dalsgaard *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 3-12 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The properties of linear, adiabatic solar oscillations are described. Use of helioseismological data to study solar structure

is outlined. Internal solar rotation is reviewed. The physics determining the oscillation frequencies is sufficiently simple that a very detailed comparison between observations and theory is possible. This provides tight constraints on the structure of the solar interior, as well as measurements of the variation of the solar rotation with depth. Author (ESA)

N85-25093# Birmingham Univ. (England). Dept. of Physics.
SOLAR OSCILLATIONS FROM TWO WIDELY SEPARATED STATIONS
G. J. Bamford, H. B. vanderRaay, P. L. Palle (I.A.C. La Laguna), and T. RocaCortes (I.A.C. La Laguna) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 13-16 refs Sponsored by UK Science and Engineering Research Council (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Potassium line data from observatories in Hawaii and Spain were used to establish the authenticity of complex solar oscillation signals. Combination of the two data sets yields precise frequency, amplitude and phase determinations. Analyses of individual lines indicate possible decay and excitation of individual modes and suggest lifetimes for the l1 modes of 85 days over the frequency range 2000 to 3800 micro Hz. The rotational splitting of the l1 modes appears less well resolved. The use of spatial filters could extend the range of l modes observable by a one dimensional solar spectrometer and, by specifically selecting the spatially simple sectoral modes, could prove to be a powerful way of determining rotational splitting. Author (ESA)

N85-25094# World Radiation Center, Davos (Switzerland). Physikalisches-Meteorologisches Observatorium.
GLOBAL SOLAR OSCILLATIONS IN IRRADIANCE AND VELOCITY: A COMPARISON
C. Frohlich and H. B. vanderRaay (Birmingham University, England) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 17-20 refs (For primary document see N85-25091 14-92)
(Contract SNSF-2.472-0.82)
Avail: NTIS HC A14/MF A01

The results of 7 hr of solar spectral irradiance measurements from a stratospheric balloon are analyzed for frequencies between 1 and 5 mHz. Significant peaks of up to 6 parts per million (ppm) in the red (778 nm) and up to 15 ppm in the blue (380 nm) can be identified as 5 min p-mode oscillations of the Sun. From bivariate time series analysis a constant relative phase close to 0 and an amplitude ratio between 1.5 and 3.2 with a maximum around 3 mHz is found. The spectra are also compared with simultaneous velocity measurements. The bivariate analysis yields a phase difference between the velocity and irradiance signals of 120 to 180 deg and amplitude ratios of 15 and 50 ppm/m/sec for the red and blue respectively. Author (ESA)

N85-25095# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
MIXING IN THE SOLAR INTERIOR
H. C. Spruit *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 21-27 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Mixing processes which can occur in a star, and why the effective diffusivity resulting from these processes is a weakly varying multiple of the kinematic viscosity are discussed. It seems unlikely that a single transport mechanism can account for the neutrino flux, the lithium depletion, and the internal rotation of the Sun. For mixing in the inner core, the two mechanisms which can not be ruled out are the 3He instability and gravity-wave mixing. The Li depletion and 3He enhancement at the solar surface indicate real mixing in the outer core, possibly due to shear instabilities. It is hard to explain the low rotation rate of the interior with any of the proposed mixing mechanisms, especially in the evolved part of the core, but only a weak magnetic field is sufficient to exert the internal torques needed to keep the Sun rotating almost uniformly. Author (ESA)

N85-25096# Goettingen Univ. (West Germany).
ON THE DETERMINATION OF THE SOLAR ROTATION AND INDICATIONS OF THE SOLAR DIFFERENTIAL ROTATION FROM AN ANALYSIS OF SOLAR INTEGRATED LIGHT
Th. Drescher (Kiepenheuer-Inst. fuer Sonnenphysik), H. Woehl (Kiepenheuer-Inst. fuer Sonnenphysik), and G. Kueveler *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 29-32 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The rotation modulation of the emission measure of the Ca+K line within the integrated solar light is used to determine the solar rotation period. Changes of this period due to the differential rotation and the different latitude regions of the activity were assessed. Model calculations based on the results of the reductions of spectroheliograms were performed to demonstrate the possibility of a determination of period changes. Solar data do not show a systematic change of the period of the emission measure within the solar cycle. Perhaps there is no such change due to the large extension of the plages in latitude and their wide scatter in area, intensity, etc., or perhaps the data are not sufficient: the periods used are too short and the photographic data are too uncertain (even photoelectric data may be too uncertain). Author (ESA)

N85-25097# Catania Univ. (Italy). Ist. di Astronomia and Osservatorio Astrofisico.
MODELS OF SOLAR DIFFERENTIAL ROTATION
R. M. Pidatella (Kiepenheuer-Institut fuer Sonnenphysik), M. Stix, G. Belvedere, and L. Paterno *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 33-35 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The dependence of the angular velocity in the Sun's convection zone on various parameters is considered. The latitude dependence of the heat transport (or the latitude dependence of the mixing length because of the assumed validity of mixing length theory) caused by the interaction between rotation and convection; and the anisotropy of the viscosity (AV) are examined as the cause of differential rotation. The former leads to meridional circulation which drives differential rotation; the latter drives differential rotation directly. Author (ESA)

N85-25098# Copenhagen Univ. (Denmark).
MAGNETOCONVECTION: THE INTERACTION OF CONVECTION AND SMALL SCALE MAGNETIC FIELDS
A. Nordlund *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 37-46 refs Sponsored by Danish Natural Science Foundation (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The consensus about photosphere interaction of convection and magnetic fields is reviewed, especially the interaction of convection in the solar convection zone with magnetic fields on the scale of granulation and supergranulation. Computer simulations of Boussinesq systems are considered, and additional effects due to stratification and radiation are discussed. Mechanisms that determine the degree of evacuation of magnetic fields in the solar photosphere are treated, and limitations of the flux tube concept are pointed out. Results from numerical simulations of convection in a stratified medium with magnetic fields are examined, and possible consequences for activity in the chromosphere and corona are mentioned. Author (ESA)

N85-25099# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
OSCILLATORY CONVECTION IN SUNSPOTS
F. Cattaneo *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 47-50 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The structure of oscillatory convection in the layers below the umbral photosphere is discussed. A linear stability analysis of a model problem describing a polytropic layer with a vertical magnetic field shows that when the Alfven speed and sound speed are comparable oscillatory convection has a mixed character exhibiting

properties of fast and slow magnetoacoustic waves. The analysis reveals that in this regime overstability is possible even in convectively stable layers. The nature of the destabilizing mechanism is discussed. Author (ESA)

N85-25100# Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
VARIABILITY OF THE STRUCTURE OF THE GRANULATION OVER THE SOLAR ACTIVITY CYCLE
R. Muller and Th. Roudier *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 51-54 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

High resolution photographs of solar granulation were computer processed to study the structure of the granulation and its variation over the solar cycle. The number of granules increases continuously toward the smaller scale: solar granulation has no dominant scale. However, the flux distribution shows that granules of size of 1.4 in contribute most to the observed intensity; the contribution from small scale and large scale granules is vanishing. This might explain why solar granulation gives the impression of having a dominant scale, although the number of granules increases toward the smaller scales. The number of granules per surface unity at the center of the disk varies over the solar cycle, confirming counts made directly on photographs: granules are more numerous near solar maximum than near minimum. Nevertheless, this result has to be confirmed on additional very high and homogeneous granulation pictures, taken from now to the next solar minimum. Author (ESA)

N85-25101# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
MAGNETIC BUOYANCY INSTABILITIES IN THE CONVECTIVE OVERSHOOT ZONE
D. W. Hughes *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 55-58 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

A linear stability analysis for a stratified magnetic layer, incorporating the effects of diffusion, wave motion and rotation was performed to test the proposition that for magnetic flux to be stored in the solar interior for times comparable to the solar cycle, the bulk of the magnetic field must be situated in the overshoot region at the base of the convection zone. Flux loss would then occur when the field becomes unstable to instabilities driven by magnetic buoyancy. Results show that instability occurrence is widespread. Author (ESA)

N85-25102# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Astronomy.
THE PHOTOSPHERIC TEMPERATURE STRUCTURE OF MAGNETIC FLUX TUBES
S. K. Solanki *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 63-66 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The temperature stratifications of plage and network flux tubes are determined by comparing a large number of observed Fe I and Fe II lines with LTE model calculations. The data are also compared with profiles calculated using different empirical models. The sensitivity of the technique to changes in the temperature stratification is demonstrated. It is shown that in order to reproduce the data correctly, a sharp dip in the flux tube temperature must occur in the photosphere, where the temperatures of tube and surroundings become similar (at equal optical depth), contrary to the results of previous models. The effects of different pressure stratifications on the depths of the iron lines are discussed and it is shown that the pressure stratification giving the best agreement with the data corresponds to a rapid expansion of the tube near the height at which the temperature dip occurs. Author (ESA)

N85-25103# Kiepenheuer-Inst. fuer Sonnenphysik, Freiburg (West Germany).
ON THE STRUCTURE OF MAGNETIC FIELDS IN THE SOLAR CONVECTION ZONE
M. Schuessler *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 67-76 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Expulsion of solar magnetic flux and vorticity; fragmentation and accumulation of fields; and the dominating forces that govern the evolution of a magnetic structure are discussed. These aspects are united in a picture of a boundary layer dynamo near the bottom of the convection zone. Author (ESA)

N85-25104# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
AMPLIFICATION AND MAINTENANCE OF THIN MAGNETIC FLUX TUBES BY COMPRESSIBLE CONVECTION
M. R. E. Proctor and N. O. Weiss *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 77-80 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The interaction between solar granular convection and thin photospheric flux tubes is discussed, and a model that includes the effects of diffusion and proper treatment of the Lorentz forces, for a thin tube whose depth is of the order of a scale height is presented. The model includes magnetic pressure (leading to evacuation of the tube) and curvature forces. It is found that while small tubes are limited principally by pressure effects, tubes with fluxes = 10 to the 18th power mx exert an important retarding force on the convection that causes them. Author (ESA)

N85-25105# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany).
NONLINEAR TIME-EVOLUTION OF KINK-UNSTABLE MAGNETIC FLUX TUBES IN THE CONVECTION ZONE OF THE SUN
F. Moreno-Insertis (Universidad de La Laguna, Spain) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 81-84 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The nonlinear development of the kink instability of a magnetic flux tube initially lying in mechanical equilibrium in the deep convection zone is presented. The unstable evolution is started by a small-amplitude sinusoidal perturbation of the shape of the flux tube in a vertical plane. As a result of the development of the instability, the lower part of the flux tube enters the radiative core and remains there confined within a fraction of the uppermost pressure scale-height of this region. The rising part of the flux tube crosses the convection zone in a dynamic time-scale of several weeks to a few months, and reaches the photosphere. A numerical code which calculates the dynamic evolution of a thin magnetic flux tube in the convection zone was developed. The code is lagrangian and allows for the compressibility of matter in the flux tube; for convection zone stratification the Spruit (1977) model is used. Author (ESA)

N85-25106# Academy of Sciences (USSR), Moscow. Inst. of Applied Mathematics.
NONLINEAR DYNAMOS
A. A. Ruzmaikin *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 85-89 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The large scale features of solar activity are explained by dynamo theory in terms of mean-field magnetohydrodynamics. The helicity dependence on the magnetic field results in stabilization of the basic 22-year oscillations. The excitation of 2 modes (of dipole and quadrupole symmetry) can create nonlinear beats which may explain the secular (60 to 80 yr) modulation. The observed torsional waves can be interpreted as a back action of the dynamo waves on the differential rotation. The actual variations in solar activity are nonperiodic. There are random recurrent episodes of reduced activity like the Maunder minimum. Nonlinear dynamo models demonstrating oscillatory-chaotic behavior are discussed. Author (ESA)

N85-25107# Newcastle-upon-Tyne Univ. (England).
THE SOLAR DYNAMO AND THE COMPLEX LORENZ EQUA-

TIONS
C. A. Jones *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 91-95 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Nonlinear mechanisms in the dynamos associated with the Sun and other lower main sequence stars are discussed using truncated model dynamo equations. The predicted relationships between rotation rate, field strength and cycle frequency are examined. The time series derived from these model equations is compared with time series from stochastic models. The model time-variations in shear are too large to be plausible if they occur over the whole convection zone; it may be, however, that dynamo action is principally confined to a layer at the base of the convection zone, in which case the model is more plausible. Author (ESA)

N85-25108# Laboratorium voor Ruimteonderzoek, Utrecht (Netherlands).
KINEMATIC DYNAMO THEORY FOR AN ARBITRARY MEAN FLOW
P. Hoyng *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 97-100 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Arbitrary, incompressible mean flow (vo) in kinematic dynamo theory is analyzed via stochastic differential equations. When the first order smoothing approximation is made the only effect of a nonzero vo is that in the definition of the tensors the turbulent velocity v is replaced by the effect of passive advection by vo. Dynamo action depends only on velocity correlations measured in a frame comoving with and distorted by the mean flow through passive advection. Conclusions apply when the analysis is extended to arbitrary order, relevant for a long correlation time. The result admits straightforward evaluation for given model mean flows. The shear in vo causes a (kinematic) anisotropy in the tensors. This can be a large effect, which comes on top of the intrinsic (dynamical) anisotropy in the velocity correlation functions. Conditions for applicability are very large magnetic Reynolds number; incompressible flows; stationary vo; and correlation time < period of the dynamo. Author (ESA)

N85-25109# Catania Univ. (Italy). Inst. of Astronomy.
SOLAR AND STELLAR MAGNETIC CYCLES: UNITY AND MULTIPLICITY
G. Belvedere *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 101-105 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The complementarity of solar and stellar observations to increase understanding of the basic phenomena and mechanisms of activity is discussed. Analysis of the characteristics of stellar cycles and their dependence on stellar parameters such as mass, convection zone depth, rotation rate, and age should highlight dynamo operation modes and, in particular, the large and small time scale dependence of the solar cycle, in the framework of the mutual interaction between the linear and nonlinear approaches. Author (ESA)

N85-25110# Observatoire de Paris-Meudon (France).
CORONAL STRUCTURES
F. ChiuderiDrago (Universita di Firenze, Italy) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 109-114 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Ground and space observations of the solar corona are reviewed. They reveal a large variety of coronal structures at all levels above the photosphere, essentially due to the presence of magnetic fields. Outer coronal structures such as coronal mass ejections reveal the essential role played by the magnetic field in confining the plasma, driving and accelerating mass motions, and thermally insulating portions of low temperature plasma from the surrounding corona. In the inner corona polarization measurements of the 5303 A line reveal a large scale homogeneous structure of the coronal field. Measurements of the Hanle effect in prominences and high resolution microwave radio maps of intensity and polarization above sunspots appear to be the only means to determine quantitatively the magnetic field vector in selected coronal features. Author (ESA)

N85-25111# Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
THE Fe XIII 10747 A AND Fe XIV 5303 A CORONAL EMISSION LINES POLARIZATION
J. Arnaud *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 115-118 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The polarization of the Fe XIII 10747 A and Fe XIV 5303 A lines was observed. Polarization direction is found to be mainly radial. The average polarization rate is below standard theoretical models by a factor of 3. It is more consistent with models taking into account depolarization effects due to density inhomogeneities and to magnetic field direction. The existence of a large scale pattern of polarization provides evidence for the existence of a large scale structure in the coronal magnetic field. The emission line polarization brightness provides a method to study the heterogeneity of the plasma and abundance of Fe in the corona. The inferred abundance is at least 0.0000007 relative to hydrogen Author (ESA)

N85-25112# Observatoire de Paris-Meudon (France).
A NUMERICAL SIMULATION OF THE FORMATION OF SOLAR PROMINENCES
J. M. Malherbe, T. G. Forbes (New Hampshire University), and E. R. Priest (St. Andrews University, England) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 119-122 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The radiative-resistive MHD equations are numerically solved in two dimensions for a magnetic field configuration that starts with a vertical current sheet which is line-tied at its base and is in mechanical, but not radiative, equilibrium. Whether this initial configuration can achieve a prominence-like equilibrium in the presence of magnetic reconnection and tearing in the current sheet is considered. Even though gravity was not incorporated into the system of equations, results indicate that the initial current sheet results in a Kuperus-Raady type of prominence and a Kippenhahn-Schluter type. The former occurs in the region above the X-line and is unstable, while the latter appears in the region below the X-line and is stable (i.e., the region of closed field line loops that develop at the base of the initial current sheet by reconnection). The effects of the radiative and nonradiative tearing modes upon the prominences are discussed. Author (ESA)

N85-25113# Observatoire de Paris-Meudon (France).
MECHANISMS OF MAGNETIC HEATING OF THE SOLAR CORONS
J. Heyvaerts (Paris VII) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 123-127 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Electric heating of the solar corona is discussed. Mechanisms of MHD wave dissipation in strong horizontal gradients of the Alfven velocity, and turbulence associated dissipation are considered. The evolution of dc coronal currents in the presence of active magnetic reconnection is examined. The interest of considering the existence of approximate global invariants associated with such phenomena is stressed. Author (ESA)

N85-25114# Saint Andrews Univ. (Scotland).
HEATING OF CORONAL LOOPS BY TEARING TURBULENCE
P. K. Browning *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 129-132 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The heating of a coronal loop by reconnection, in response to slow photospheric motions is discussed. A generalized version of Taylor's hypothesis is used to show that the field evolves through a sequence of linear force-free states (inverse delta B = alpha

B), where a helicity evolution equation is used to determine alpha (t). It is shown that the method is invariant to the choice of gauge. General evolution equations of a coronal loop, modeled as a straight cylinder, are derived. For solid body motions, it is shown that alpha is constant in time, and the heating is calculated.
Author (ESA)

N85-25115# Oxford Univ. (England). Dept. of Theoretical Physics.
OBSERVATIONAL CONSTRAINTS ON HEATING PROCESSES
C. Jordan, B. Mendoza, and R. S. Gill *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 133-136 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

It is shown how spectroscopic measurements of emission line fluxes and widths relate to the plasma paramaters relevant to wave heating processes, e.g., the magnetic field strength and its fluctuation, the damping length and plasma beta. In the solar transition region and inner corona it is found that beta < 1 rather than < 1, a regime where it is difficult to specify the most relevant wave propagation and dissipation modes. But in low gravity, low density stellar coronas beta < 1 and shock dissipation of fast mode MHD waves is promising. The need for further measurements of line profiles and of flux and profile periodicities in the inner corona is stressed and it is shown how systematic studies across coronal holes might elucidate the solar coronal heating mechanism.
Author (ESA)

N85-25116# Saint Andrews Univ. (Scotland). Dept. of Applied Mathematics.
WAVES IN INHOMOGENEOUS MEDIA
B. Roberts *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 137-145 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The theory of magnetohydrodynamic waves in a magnetically structured atmosphere is reviewed. Continuously and discretely structured media are considered, with applications to coronal loops, open field regions, sunspots, and H alpha fibrils. Analogies with other subjects (e.g., oceanography, fiber optics) are drawn. The propagation on an inpulsively generated fast magnetoacoustic wave in a density duct leads to periodicities of a second in the corona and tens of seconds in the chromosphere.
Author (ESA)

N85-25117# Scuola Normale Superiore, Pisa (Italy).
MAGNETIC INSTABILITIES
G. Einaudi *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 147-153 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Theoretical aspects of ideal and resistive instabilities related to solar phenomena are reviewed. The interest in the stability of solar coronal structures derives from their observed lifetime (much longer than the relevant hydromagnetic timescale) coupled with their active behavior. This means that they must be generally stable with respect to fast, destructive instabilities, typically those governed by the ideal MHD equations, and, at the same time, they must allow slow, nondisrupting, dissipative processes to take place.
Author (ESA)

N85-25118# Catania Univ. (Italy). Ist. di Astronomia.
AXISYMMETRIC MAGNETOFLUIDISTATIC (MFS) EQUILIBRIA OF SOLAR CORONAL LOOPS: AN INTEGRAL EQUATION APPROACH
V. AntonuccioDelogu *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 155-157 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The equilibrium magnetofluidostatic (MFS) problem is formulated as an extremum problem for the energy integral. The resulting equations, obtained from general theorems of the calculus of variations, are transformed into integral equations, and these, together with conditions specifying the position of the feet of the field line, form a system of integral equations. Previously known configurations, like the pinch, are easily found with this method, which allows the analysis of two dimensional configurations of general aspect. The intrinsic limits of this method and the fundamental aspects of the MFS problem for coronal loops are discussed.
Author (ESA)

N85-25119# Catania Univ. (Italy). Ist. di Astronomia.
THE ROLE OF DIFFERENTIAL ROTATION IN MAGNETIC ENERGY STORAGE
R. A. Zappala, F. Zuccarello, and M. Kuperus (Utrecht University) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 159-162 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

It is suggested that the storage of magnetic energy in coronal loops is associated with the shearing of the field lines by differential rotation. A loop interconnecting two sunspots belonging to two active regions of different ages can be considered as a loop having a fixed footpoint and another moving with the relative velocity of the two sunspot-groups. With a relative velocity of 10,000 cm/sec an amount of magnetic energy of the order of 10 to the 28th power ergs may be stored. If the storage time scale is compared with dissipation time scale due to an unspecified mechanism, the situations: the stored energy is not released, negligible heating in the loop; energy is still stored but there is heating in the loop; and negligible stored magnetic energy, heating in the loop can be distinguished.
Author (ESA)

N85-25120*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SCIENCE WITH THE SOLAR OPTICAL TELESCOPE (SOT)
Stuart D. Jordan *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 165-175 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Use of the Solar Optical Telescope (SOT) to study the energetics and dynamics of the solar atmosphere is described. Studies include the origin and evolution of the Sun's magnetic field, the structure of solar subsurface convection, the heating of the outer solar atmosphere, and sources of the solar wind in the lower lying regions of the outer atmosphere. To achieve the scientific goals of the SOT, it is necessary to observe features in the solar atmosphere on the scale of a typical photon mean-free-path in continuum radiation and also of the hydrodynamic or density scale-height. The 1.3 m telescope, of a Gregorian configuration, achieves close to 0.1 arcsec angular resolution on the Sun in visible and ultraviolet wavelengths.
Author (ESA)

N85-25121# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Astronomy.
SCIENCE WITH THE SOLAR AND HELIOSPHERIC OBSERVATORY (SOHO)
M. C. E. Huber and M. Malinovsky-Arduini (CNRS, Verrieres-le-Buisson, France) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 177-183 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Use of the Solar and Heliospheric Observatory to study the interior structure of the Sun, the heating of the corona and its expansion as solar wind are discussed. The observations needed to pursue these questions will be taken from a halo orbit around Lagrange point L1 on the Earth-Sun line, which offers uninterrupted observations of the Sun and (lying outside the magnetosphere) solar wind streams. The payload includes helioseismology, optical plasma diagnostics of the corona at extreme ultraviolet and visible wavelengths, and in-situ particle and field measurements.
Author (ESA)

N85-25122# Arizona Univ., Tucson. Dept. of Physics.
THE INTERN. ROTATION OF THE SUN INFERRED FROM THE ROTATIONAL SPLITTING OF ACOUSTIC AND GRAVITY MODE MULTIPLETS
H. A. Hill, D. S. Yakowitz, R. D. Rosenwald, and W. Campbell (Haverford College, Pa.) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 187-188 refs Sponsored by NSF and Air Force

Office of Scientific Research (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Measures of the equatorial surface frequency and measures of rotational splitting from 100 nonradial multiplets of acoustic modes and internal gravity modes are used to infer the internal rotation of the Sun. The rotational splitting measures are obtained from diameter type observations, where the effects of differential rotation were included in the data analysis. It is found that the omega rises 30% just below the surface and is proportional to it in the convection zone. The omega then makes a sharp transition to 3 micro Hz at the bottom of the convection zone and decreases by 3% in going from the convection zone to the core. The sharp transition locates the bottom of the convection zone at 0.75R. The observed rotational effects r sup -1.5. are consistent with the inferred omega, and omega is stable to the Rayleigh criterion in the convection zone. Author (ESA)

N85-25123# Crimean Astrophysical Observatory (USSR).
TEN YEARS OBSERVATIONS OF LONG-PERIOD OSCILLATIONS OF THE SUN
V. A. Kotov, A. B. Severny, and T. T. Tsap *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 189-190 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The measurements of Doppler shift of a Fraunhofer spectral line were performed over 10 yr. The power spectrum of the data shows a major peak at 160m period which is interpreted as multiple resonance of gravity modes of the Sun. This 160m oscillation reveals remarkable phase stability during the entire decade. It is noted that true pattern of the power spectrum can be seriously spoiled by Earth sources of noise. The importance of analysis of oscillations seen in a telluric line is emphasized. Author (ESA)

N85-25124# Naples Univ. (Italy). Ist. di Fisica Sperimentale.
THE RESPONSE OF THE LINE KI 7699 TO THE SOLAR OSCILLATIONS
C. Marmolino, G. Roberti, G. Severino (Osservatorio Astronomico di Capodimonte), M. Vazquez (Instituto de Astrofisica de Canarias), and H. Woehl (Kiepenheur Institut fuer Sonnenphysik) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 191-194 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The time behavior of the KI 7699 line profile in presence of acoustic-gravity waves with periods of 300, 180, and 30 sec was studied. The response of the line to the waves depends strongly on the period and is not linear for the 30 sec wave. The height increase of the amplitude in the longer period waves explains the observed anticorrelation between line asymmetry and line core shift. The time averaged profile for the 30 sec wave has a red shifted line core. This could account for the lowest part of the C shaped solar bisectors. Author (ESA)

N85-25125# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
ENERGY RELATIONS ON THE SMALL OSCILLATIONS EXCITATION IN THE STARS
W. G. Gavryusev and E. A. Gavryuseva (Academy of Sciences, Moscow) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 195-196 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

It is shown that some derivations of the Eddington formula are incorrect. However the formula of the work integral is correct because it is the consequence of the linear equations of oscillations. The work integral is equal to the change of the star oscillations energy over the period but not total star energy. Author (ESA)

N85-25126# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
CONDITIONS OF THE SMALL OSCILLATIONS EXCITATION IN THE DIFFERENT SOLAR MODELS WITH THE MIXED CORE
W. G. Gavryusev and E. A. Gavryuseva (Academy of Sciences, Moscow) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 197-198 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The growth rates of dipole and quadrupole oscillations were calculated in quasi-adiabatic approximation in solar models with mixed core. Some modes have advantages in the excitation at the expense of nuclear reaction energy. The oscillation is great inside the core when the node of the radial displacement is on the mixed core boundary. Such a property of oscillations can help to explain the peculiarity of 160-min oscillation in solar models with mixed cores. Author (ESA)

N85-25127# Katholieke Universiteit te Leuven (Belgium). Astronomisch Inst.
LINEAR INCOMPRESSIBLE MAGNETOCONVECTION IN A PLANAR LAYER WITH A NONUNIFORM HORIZONTAL MAGNETIC FIELD
D. Hermans (National Fund for Scientific Research of Belgium), M. Goossens, and R. Polfliet *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 199-200 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The linear stability of an incompressible planar layer in the presence of nonuniform horizontal magnetic field is studied for three sequences of equilibrium configurations. It is found that the Alfven continuum is fundamental for the understanding of the linear stability. Complete stabilization is only obtained when min sigma sq A (z) $>$ 0 in the layer where d rho/dz $>$ 0, and can be achieved by transition of unstable regular normal modes either into stable regular normal modes or into the stable Alfven continuum. Author (ESA)

N85-25128# Katholieke Universiteit te Leuven (Belgium). Astronomisch Instituut.
LIBRIUM WITH A MIXED POLOIDAL AND TOROIDAL MAGNETIC FIELD WITH GRAVITY INCLUDED
TIC FIELD WITH GRAVITY INCLUDED
S. Poedts, M. Goossens, and D. Hermans (National Fund for Scientific Research of Belgium) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 201-202 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The continuous spectrum of a static, axisymmetric self-gravitating equilibrium with a mixed poloidal and toroidal magnetic field is given by an eigenvalue problem of two coupled ordinary second-order differential equations. The solutions have motions in the magnetic surfaces that are not polarized purely perpendicular and purely parallel to the magnetic field lines and show mixed properties. This coupling of the classical Alfven and cusp continuum is due to the toroidal magnetic field component and even persists in the incompressible limit. A variational expression was derived for the continuum frequencies and it is shown that the continuum frequencies can be negative. The stability depends on the distributions of density and pressure in the magnetic surfaces. Author (ESA)

N85-25129# Kiepenheuer-Inst. fuer Sonnenphysik, Freiburg (West Germany).
A MODEL FOR THE DYNAMICS OF THE DEEP PHOTOSPHERE
A. Nesis *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 203-204 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The small-scale vertical and horizontal velocities of different layers in the solar atmosphere were measured using spectrograms with absorption lines of different strength. A model of the vertical and horizontal velocities was obtained with the method of velocity weighting functions. The vertical and horizontal velocities of convective origin decrease up to a height of 150 km and 200 km respectively. Above this level they increase with different slope. The results infer the existence of a secondary velocity field at higher photospheric levels induced by convective motions. Author (ESA)

N85-25130# Applied Research Corp., Greenbelt, Md.
LINEAR MODELS OF ACOUSTIC WAVES IN SUNSPOT UMBRAE
J. B. Gurman and J. W. Leibacher (National Optical Astronomy Lab.) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 205-206 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The 5.5 to 8.5 mHz oscillations observed in umbral chromospheres and transition regions are interpreted as acoustic waves propagating parallel, or nearly parallel, to the temperature gradient. These waves are not totally internally reflected by the steep temperature gradient, and, thus, are not trapped. Partial reflections, however, are effective in modulating the transmission as a function of frequency. In a two-dimensional, linear, adiabatic treatment, the resonant transmission mechanism is found to produce a spectrum of resonances in the transmission of acoustic waves in any plane-parallel atmosphere with a temperature minimum. Since the observed umbral oscillations display power in only a narrow range of frequencies, characteristics of the umbral models, wave propagation, and observations that would tend to suppress the higher frequency resonances are examined. Author (ESA)

N85-25131# National Optical Astronomy Lab. Tucson, Ariz. National Solar Observatory.
OBSERVATIONAL ASPECTS OF SUNSPOT OSCILLATIONS
Bruce W. Lites *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 207-209 refs Sponsored by NSF (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Observations of sunspot umbral oscillations in Ca II H and He I 10830 A are presented. They show that they have high amplitude in the upper chromosphere. The umbral oscillations have several cospatial frequency modes. The amplitude of the umbral 3 min chromospheric oscillation is not correlated with the amplitude of the 5 min oscillations in the umbral photosphere. The spatial distribution of amplitudes of photospheric and chromospheric oscillations may reveal the geometry of the penumbral magnetic field. Author (ESA)

N85-25132# University of Western Ontario, London. Dept. of Astronomy.
STELLAR GRANULATION
D. F. Gray *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 211-212 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Properties of stellar granulation are inferred from observed line bisectors. The average granulation velocities of dwarfs and giants increase with increasing effective temperature. The dispersion of granule velocities increases with the mean granulation velocity. The mean rise velocity of granules must be small compared with line broadening. The flux contributed by the intergranular lines is always small compared to the flux from the granules; ratios are 0.15. The velocity difference between hot and cold falling streams should be the parameter associated with the stellar granulation velocity. Author (ESA)

N85-25133# Carnegie Institution of Washington, Pasadena, Calif. Mount Wilson and Las Campanas Observatories.
DID THE YOUNG SUN ROTATE AT 100 km/s
D. K. Duncan, G. W. Marcy, and R. D. Cohen (California University, San Diego) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 213-215 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The H alpha emission with full width at its base of 700 km/sec was observed in the young main sequence K star, HII 1833 of similar mass to the Sun. The centroid and the width of the emission vary synchronously with the 0.24-day rotation period or this Pleiades star. Based on the ratio H alpha/H beta, the absence of forbidden lines, and the inferred gas kinematics, this star must have an extended (chromospheric) emission region of order 1 stellar radius in size. The periodic Doppler shifts of H probably arise from a wind with oppositely directed streams. If a significant fraction of the high velocity material escapes from the star it will spin down in < or = 10 million yr. This suggests that its remarkable properties represent a natural, though transient stage in the evolution of solar-type stars. Author (ESA)

N85-25134# Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
THE SCANNING HELIOMETER
J. Roesch (Paris VI Univ.) and R. Yerle *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 217-218 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

A heliometer operating by fast photoelectric scans of opposite limbs simultaneously is described. It was designed for solar diameter measurements, but it also provides data for helioseismology, since it measures the fluctuations of the maximum brightness gradient all around the solar limb. An example of scans is presented. Author (ESA)

N85-25135# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany).
THE GENERATION OF MAGNETIC FIELDS BY A FLOW WITH CHAOTIC STREAMLINES
D. J. Galloway and U. Frisch (CNRS, Nice) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 221-222 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Kinematic dynamo action due to a spatially periodic flow with regions of chaotic streamlines is investigated numerically, using a spectral method. Dynamos appear to be the rule rather than the exception, but in the most extensively investigated case they occur in 2 (or more) windows, for values of the magnetic Reynolds number Rm between 8 and 18, and for Rm > 27 up to 200 or more. The structure of the magnetic field generated is complex, but appears correlated with the location of the chaotic regions and with the stagnation points of the flow, in cases where these exist. Author (ESA)

N85-25136# Goettingen Univ. (West Germany).
DYNAMO ACTION OF MAGNETOSTROPHIC WAVES
D. Schmitt *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 223-224 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The stability of solar magnetostrophic waves in a horizontal thin plane layer of a perfectly conducting fluid, which is stratified according to gravitation and permeated by a variable toroidal magnetic field is considered. The layer rotates rigidly around an axis inclined to the horizontal plane. It is shown that unstable magnetostrophic waves, driven by magnetic buoyancy, are capable of inducing an electromotive force parallel to the toroidal magnetic field. This dynamical effect is an alternative to the kinematical alpha effect and of importance for the dynamo theory of intermittent strong magnetic fields. For parameters of the lower solar convection zone the process leads to an effective alpha of a few cm/sec. Dynamo action for various angles of inclination is discussed.
Author (ESA)

N85-25137# Helsinki Univ. (Finland). Observation and Astrophysical Lab.
CYCLIC FLOWS IN THE SOLAR CONVECTION ZONE DUE TO THE DYNAMO REACTION
I. Tuominen, H. Virtanen, F. Krause (Akademie der Wissenschaften, Potsdam, East Germany), and G. Ruediger (Akademie der Wissenschaften, Potsdam, East Germany) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 225-226 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The feedback of the oscillating mean magnetic field of the kinematic alpha omega dynamo on the mean flows in the Sun is investigated. The observational constraints on the magnetic field and on the mean cycle-dependent flows (the time variations of the differential rotation and meridional motion) accord with the dynamo excitation mechanism. The solutions of the mean-field equations of motion give the observed components of the mean

flows. The detailed properties of the flows give a possibility to investigate the dynamo mechanism itself. Author (ESA)

N85-25138# Kiepenheuer-Inst. fuer Sonnenphysik, Freiburg (West Germany).
CONVECTIVE COLLAPSE AND OVERSTABLE OSCILLATIONS IN SOLAR FLUX TUBES
S. Sirajul Hasan *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 227-228 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The collapse of solar flux tubes by a convective instability is investigated. At the initial epoch it is assumed that the flux tube is in hydrostatic equilibrium and that it has the same temperature as the ambient medium. The superadiabatic stratification in the tube drives a convective instability. If the initial equilibrium is perturbed by the introduction of a small downflow in the tube, convective collapse occurs leading to magnetic field intensification. The final state consists of overstable oscillations with periods typically around 1000 sec. It is found that the surface magnetic field is in the observed 1 to 2 kG range. There is an oscillating flow (unidirectional at any instant) with an amplitude 1 to 2 km/sec and an average value around 0. Author (ESA)

N85-25139# Universidad de la Laguna (Spain). Inst. de Astrofisica de Canarias.
THE FLUX ROPE MODELS CHECKED BY SOME OBSERVATIONS
J. I. GarciadelaRosa *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 229-230 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

High resolution H alpha and white light observation of the birth of 73 active regions (AR) were used to check models of sunspots. It is concluded that large AR result from the emergence of a compact and twisted flux rope, while the small ones are produced by the clustering of flux tubes by supergranular motions. Author (ESA)

N85-25140# Universidad de la Laguna (Spain). Inst. de Astrofisica the Canarias.
A CONSIDERATION OF THE SOLAR CYCLE IN THE LIGHT OF THE BEHAVIOR OF THE LARGE ACTIVE REGIONS
J. I. GarciadelaRosa *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 231-232 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The solar cycle was studied by considering only the large active regions (AR), with small region data being ignored. Results show that at birth almost all the large AR display the correct inclination (p-part at lower latitude) while the small AR show random behavior. The maximum latitude attained by the large AR is lower by 10 deg than that of the small ones. The overlapping of contiguous cycles disappears when only large AR are considered. The number distribution of large AR differs from the Wolf number, which mixes large and small AR. Author (ESA)

N85-25141# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
SOLAR CYCLE VARIATIONS OF SUNSPOT TEMPERATURES
P. Maltby, S. B. Barth, P. B. Lilje, and E. W. Vikanes *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 233-234 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Observations of the umbra/photosphere intensity ratio for large sunspots are discussed. Data for 1968 to 1983 are presented, covering most of the solar cycles 20 and 21. The observed solar cycle variation is reflected in a correlation between umbra/photosphere intensity ratio and the sunspot latitude. The umbral and penumbral intensities of the same sunspot are well correlated. This suggests that the responsible mechanism acts on the whole sunspot. No correlation between intensity and other parameters such as magnetic field and size is detected for sunspots with umbral radii > 5 sec of arc. Author (ESA)

N85-25142# Solar Physics Research Corp., Tucson, Ariz.
SOLAR CYCLE VARIATION OF EPHEMERAL ACTIVE REGIONS
Karen L. Harvey *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 235-236 refs Sponsored in part by AFGL and NOAA (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Ephemeral active regions (ER) were identified and counted for periods from 1970 to mid-1984 using daily, full-disk photospheric magnetograms. The number of ER varies in phase with the solar cycle. At solar minimum, ER are distributed almost uniformly in latitude; by solar maximum, peaks in the latitude distribution are observed in the sunspot zones and in two higher bands. From 20% to 30% of the He I 10830 dark points, used as a proxy for X-ray bright points (XBP), are associated with ER; 70% to 80% overlie bipoles that appear to be the chance encounter of opposite polarity network. It is suggested that ER are primarily surface phenomena, resulting from convection interacting with subphotospheric fields; and XBP are associated with the chance encounter of network flux, the occurrence of which is related to the amount of mixed polarity areas which varies inversely with the solar cycle. Author (ESA)

N85-25143# Observatoire de Paris-Meudon (France).
THE FIRST EFFECT OF THE AMPLITUDE OF A SOLAR CYCLE
P. A. Simon and J. P. Legrand (Institut National d'Astronomie et de Geophysique) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 237-238 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The mechanism at the origin of the generation of geomagnetic activity by wind streams situated at both polar holes of the Sun is discussed. The stream expansion factor is controlled by the polar field intensity which thereby is monitored by the level of this geomagnetic activity. The poloidal field begins to emerge at low latitude 1 or 2 yr before a sunspot maximum and moves toward the poles. As 2 or 3 such low latitude mergences currently occur, the intensity of the polar field increases regularly and peaks 5 yr after the sunspot maximum. Then it decreases smoothly and disappears 1 or 2 yr after the next sunspot maximum in order to leave the polar cap to the new field. This poloidal field, as expected from dynamo theory, is not axisymmetric. The total duration of the solar cycle phenomena is 21 yr with 13 yr of poloidal field and 13 of toroidal field emergence and an overlaping of 6 yr of the first one on the second and a delay of 5 yr between both intensity peaks. Author (ESA)

N85-25144# Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
VARIABILITY OF THE QUIET PHOTOSPHERIC NETWORK
R. Muller and Th. Roudier *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 239-240 (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

High resolution photographs of the photospheric network taken in the CaIIK 3933A line and 4308 A are analyzed to study the variation in latitude and over the solar cycle of facular points per surface unity. It appears that the density of the photospheric network is not distributed uniformly at the surface of the Sun: in September 83 it was weakened at the low (equatorial) and high (polar) active latitudes, while it was tremendously enhanced toward the pole. The density at the equator varies in antiphase to the sunspot number: it increases by a factor 3 or more from maximum to minimum of activity. Implications for the latitude and cyclic variation of the magnetic flux in the quiet Sun are discussed. Author (ESA)

N85-25145# California State Univ., Northridge. Dept. of Physics and Astronomy.

OBSERVATIONS CONCERNING ENERGY BALANCE IN SOLAR MAGNETIC REGIONS

G. A. Chapman, A. D. Herzog, and J. K. Lawrence *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 241-242 refs Sponsored in part by NSF (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Photometric observations of a long-lived complex of solar activity are considered. Analysis suggests that there is storage of energy in active regions and a significant fraction (over one-half) of this stored energy is radiated from magnetic elements (faculae) of the active region. Author (ESA)

N85-25146# National Observatory of Athens (Greece).
A STUDY OF THE MATERIAL MOTION INTO AN ERUPTIVE PROMINENCE

Th. Prokakis, D. Dialetis, and C. Macris *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 243-244 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The time evolution of the material motion into an eruptive prominence was studied. The observational material was obtained with an H alpha filter. Isodensity map contours were used to formulate the geometrical structure of the loops and to describe the material motion through them. Twisting of the material flow along the loop was studied. Interpretation of such a phenomenon by considering the visible trajectory as describing the magnetic skeleton in the coronal space is proposed. Author (ESA)

N85-25147# National Observatory of Athens (Greece).
A SIPHON FLOW MODEL FOR EVERSHED MOTION

D. Dialetis and C. E. Alissandrakis (Athens University) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 245-246 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The motion of an inviscid isothermal plasma under the influence of gravity along the lines of force of an axially symmetric magnetic field was studied. The solutions of the MHD equations are compared with observations of the Evershed motion in H alpha. The flow covers a more extended area and has a higher velocity along lines of force which extend higher up. The velocity rises rapidly with distance from the axis, reaches a maximum near the region where the magnetic field is horizontal and subsequently decreases slowly. The distance of the maximum velocity region from the axis increases with height. The general behavior of the solutions agrees with the observations, which show that the maximum is located within the penumbra in the photosphere and outside the penumbra in the chromosphere. Author (ESA)

N85-25148# Saint Andrews Univ. (Scotland). Dept. of Applied Mathematics.
CORONAL HEATING BY TURBULENT PHASE MIXED MHD WAVES

L. Nocera and E. R. Priest *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 249-251 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The possibility of transferring mechanical and magnetic energy from MHD waves propagating in the solar corona to smaller and smaller scales via nonlinear effects, starting from a phase-mixed configuration is studied. The efficiency of this turbulent cascade and the turbulent spectra (in space and time) are worked out numerically. The time spectrum suggests the onset of chaotic behavior, The resulting heating rate meets the energetic requirements to heat the corona. Author (ESA)

N85-25149# Instituto Superior Tecnico, Lisbon (Portugal).
EFFECTS OF ATMOSPHERIC STRATIFICATION ON DISSIPATIVE ACOUSTIC AND ALFVEN WAVES

L. M. B. C. Campos *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 253-255 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Acoustic and Alfven gravity waves in a compressible atmosphere, in the presence of a magnetic field, with dissipation respectively by fluid viscosity and electrical resistance are studied. It is argued that acoustic gravity waves grow rapidly in the chromosphere, but in the corona their amplitude is limited by the increasing kinematic viscosity, which may alternatively increase the distance traveled until a shock forms. For Alfven-gravity waves, electrical resistance is predominant as a diffusion process in the convection zone, but in the atmosphere it does not significantly affect the waveform, which is determined by the increase of Alfven speed with altitude accelerating the wave. It is shown that the relative amplitude of Alfven gravity waves decreases with altitude, unlike acoustic gravity waves, which grow into a nonlinear regime, and form shocks. Hydrodynamic waves dominate the mass, and hydromagnetic waves the energy, balance in the solar atmosphere. Author (ESA)

N85-25150# Saint Andrews Univ. (Scotland). Dept. of Applied Mathematics.
ON RUNNING PENUMBRAL WAVES

L. M. Small and B. Roberts *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 257-259 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Running penumbral waves are modeled as magnetoacoustic-gravity modes propagating along the lower boundary of the penumbral magnetic field. The theoretical properties of surface modes on the boundary show that it is not necessary to invoke trapping of magnetoacoustic-gravity modes (by increasing sound and Alfven speeds away from the boundary) to produce the confinement of the modes to the photospheric/chromospheric region. Running penumbral waves are interpreted as fast magnetoacoustic surface modes. Author (ESA)

N85-25151# Washington Univ., St. Louis, Mo. Center for Space Sciences.
THE POSSIBLE ROLE OF ELECTRICAL CURRENTS IN CORONAL PHENOMENA

E. Gliner, V. Osherovich (Colorado University), and I. Tzur (National Center for Atmospheric Research) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 261-262 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Models of solar coronal phenomena are used to argue that the difference between the minimum and maximum types of the solar corona is due to electrical coronal currents. Global coronal current coupling with a solar magnetic field causes typical patterns of the solar corona in minimum epochs. The symmetric coronal pattern of maximum epoch is explained by the deficiency of a global current. Author (ESA)

N85-25152# Observatoire de Paris-Meudon (France).
CORONAL STRUCTURES OBSERVED AT METRIC WAVELENGTHS WITH THE NANCAY RADIOHELIOGRAPH

C. E. Alissandrakis, P. Lantos, and E. Nicolaidis (Athens University) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 263-264 refs Sponsored by Greek National Science Foundation, Observatoire de Paris-Meudon and CNRS (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Two-dimensional maps of the Sun at 169 MHz, obtained with a radioheliograph, with resolution of 1.5 by 4.2 in. are presented. Bright features on the maps are sources of noise storm continua, as evidenced by their position relative to active regions and by the occurrence of type 1 bursts. Weaker emission regions are associated with neutral lines of the photospheric magnetic field. No sources associated with extended quiescent filaments are found. Depressions on the maps correspond to coronal holes both in the equatorial region and near the poles. Results indicate that the notion of the slowly varying component at metric wavelengths may have to be reexamined, since sources of different nature may have been grouped in this component. Author (ESA)

N85-25153# Institut d'Astrophysique, Paris (France).
EMPIRICAL MODEL OF THE SOLAR CORONA USING SOLAR-CYCLE RELATED PARAMETERS
S. Koutchmy and M. Loucif *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 265-267 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Using solar eclipse pictures, the distribution of streamlines over the outer corona was analyzed. The extension of polar regions and especially the deviations of streamlines from the radial direction are well related to the phase of the solar cycle. The locations of chromospheric filaments are considered to build up a three dimensional picture of the streamlines which is believed to give a good representation of the observed distribution of the coronal electron densities. Author (ESA)

N85-25154# Stanford Univ., Calif. Center for Space Science and Astrophysics.
HARMONIC ANALYSIS OF THE SOLAR MAGNETIC FIELD
J. T. Hoeksema and P. H. Scherrer *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 269-270 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The spherical harmonics of the global solar magnetic field were calculated using photospheric field measurements. Near minimum the heliospheric field is predominantly a dipole field with a small quadrupole warp which influences the interplanetary medium at the Earth's latitude. Near solar maximum the magnitudes of the quadrupole and octopole components are comparable to the dipole. During most of the cycle the field cannot be adequately described as simply a dipole or tilted dipole. The polar and equatorial components of the dipole evolve independantly which means that the field evolution during the solar cycle should not be described as a rotating dipole. The amplitude modulation of the harmonics suggests a beating phenomenon among a few signals with closely spaced periods. Spectral analysis of the equatorial dipole shows dominant peaks at 27.0 and 28.2 days. The higher order harmonics have similar characteristics.
Author (ESA)

N85-25155# Osservatorio Astrofisico di Arcetri, Florence (Italy).
ENERGY BALANCE IN RESISTIVE INSTABILITIES
G. Torricelli-Ciamponi *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 271-272 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

A one dimensional current sheet model, where magnetic reconnection takes place, is considered. The analysis shows how perturbation changes the balance between magnetic and thermal energy in the thin resistive region and in the wide ideal one.
Author (ESA)

N85-25156# Observatoire de Paris-Meudon (France).
MAGNETIC INSTABILITIES IN SOLAR FILEMENTS: MODELS OF TWISTING MOTIONS AND EJECTA
B. Schmeider, J. M. Malherbe, and M. Raadu (Royal Institute of Technology, Stockholm) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 273-274 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Time sequences of two destabilized solar filaments were derived using a spectrograph operated in H alpha. The opposite directed velocities observed in the first filament are interpreted in terms of a twisted magnetic flux rope model. The sudden disappearance of the second filament corresponds to high velocity plasmoids confined in magnetic field lines and then ejected. Author (ESA)

N85-25157# Universidad de Palma de Mallorca (Spain). Dept. de Fisica de la Tierra y del Cosmos.
ABOUT SUDDEN DISAPPEARANCES AND REAPPEARANCES
J. L. Ballester *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 275-276 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

Sudden Disappearances (SD) and reappearances relationships with active centers, maximum and minimum of solar cycle, latitude, coronal holes, flares, emerging flux and age of neutral lines were studied for a 50 yr period. The major fraction (68%) of SD affects filaments not in active centers. The fraction of filaments that reforms is the same (23%) in or out active centers. The number of SD rises as solar activity maximum is reached and decreases with the decay of activity. The same occurs with reappearances. The number of SD in polar filaments peaks a few years before the maximum of solar activity. The number of SD in Northern Hemisphere is greater than in the Southern. The expansion or modification of a coronal hole might trigger the SD of a nearby filament and the filament may never reappear inside the coronal hole. This suggests the transformation of a closed magnetic structure into an open one. Author (ESA)

N85-25158# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Astronomy.
PROMINENCES, TWO-RIBBON FLARES AND CORONAL TRANSIENTS
G. W. Pneuman (National Center for Atmospheric Research) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 277-278 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

A scenario for prominence formation and eruption with an associated coronal transient and two-ribbon flare is suggested. The same magnetic field configuration is used for all three events: a figure 8 with an elevated neutral line low in the corona upon which the prominence rests. A plausible mechanism for eruption is argued to be a constriction of the structure near the base due to forces exerted by the external magnetic field. This mechanism can provide the upward force needed to drive the transient, and is consistent with the hot rising X-ray flare loops seen in the corona during flares. Considering two limiting cases, pressure dominated and magnetically dominated structures, the dynamical response as a result of lateral constriction is calculated and the results compared with observation. Author (ESA)

N85-25159# Turin Univ. (Italy). Ist. di Fisica.
SOLAR MAXIMUM MISSION RESULTS ON THE ENERGETICS OF THE IMPULSIVE PHASE OF SOLAR FLARES
E. Antonucci and A. H. Gabriel (Science and Engineering Research Council, Chilton, England) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 279-280 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The presence of chromospheric material evaporating in response to localized heating to coronal temperatures is inferred from Solar Maximum Mission observations of systematic plasma upflows during the rise of the soft X-ray emission in solar flares. This period corresponds also to the interval during which energy is deposited in the chromosphere, as inferred from the impulsive hard X-ray emission. The analysis of the soft X-ray emission from the coronal source and the plasma upflows suggests that chromospheric evaporation can be considered as the main mechanism responsible for the formation of the coronal thermal plasma during a flare. This occurs by accumulation of the evaporated plasma in a magnetically confined coronal region, provided the upflows have an electron density of the order of 100 billion cc, and an electron temperature of 10 to 20 million K.
Author (ESA)

N85-25160# Birmingham Univ. (England). Dept. of Space Research.
A STUDY OF THE MORPHOLOGY OF SOLAR FLARES AS OBSERVED BY THE HARD X-RAY IMAGING SPECTROMETER
R. A. Harrison and G. M. Simnett *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 281-282 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The hard X-ray imaging spectrometer on board the Solar

Maximum Mission observed several hundred solar flares in the 3.5 to 30 keV energy region. Analysis of a subset of these events, chosen to represent all active regions viewed shows that the majority of flares conform to the scenario; in 3.5 to 30 keV X-rays, the impulsive burst defines a system of low lying coronal magnetic loops. The soft X-ray flare expands into a larger well resolved loop system and frequently an even larger overlying structure is involved with foot points separated by several hundred thousand km. A flare model involving a single magnetic loop is rarely, if ever, appropriate. Author (ESA)

N85-25161# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany).
MAGNETIC FIELD STRUCTURES OF HARD X-RAY FLARES OBSERVED BY HINOTORI SPACECRAFT
Takashi Sakurai (Tokyo Univ.) *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 283-284 refs (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The magnetic field structure of five flares observed by HINOTORI spacecraft is studied. The double source structure of impulsive flares indicates hard X-ray emission from the two footpoints of a flaring loop. The potential field computation, however, does not reproduce a loop connecting the two sources, implying that the magnetic field could be in a highly sheared configuration. Gradual flares are characterized by hard X-ray sources located in the corona, 20,000 to 40,000 km above the photosphere. The potential field modeling is found to give a reasonable fitting in this type of flare, and the hard X-ray sources are located at the top of the magnetic loop or arcade, as is expected in the thick-target trap model of hard X-ray bursts. Author (ESA)

N85-25162# Laboratorium voor Ruimteonderzoek, Utrecht (Netherlands).
SOLAR MAGNETOHYDRODYNAMICS: SYMPOSIUM REVIEW
C. deJager *In* ESA The Hydromagnetics of the Sun Nov. 1984 p 287-290 (For primary document see N85-25091 14-92)
Avail: NTIS HC A14/MF A01

The overall structure of the Sun, solar magnetic fields, and the corona are reviewed. Radial variation of solar density and angular rotational velocity; internal mixing in the Sun; solar granulation; magnetic convection; umbral oscillations in sunspots; solar cycle variations; magnetic flux tubes; dynamo theory; coronal heating; coronal mass ejection; and solar activity are covered. Author (ESA)

N85-24565*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
COUPLING OF THE SOLAR WIND TO MEASURES OF MAGNETIC ACTIVITY
R. L. McPherron, R. A. Fay, C. R. Garrity, L. F. Bargatze, C. Robert Clauer (Stanford Univ.), Craig Searls (Sandia National Lab., Albuquerque, New Mex.), and D. N. Baker (LASL) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 161-166 refs Sponsored by Inst. of Geophysics and Planetary Physics and Office of Academic Computing) (For primary document see N85-24544 14-46)
(Grants NGL-05-007-004; NSF ATM-83-18200; N000-14-C-0158)
Avail: NTIS HC A99/MF E03 CSCL 04A

N85-24584# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
THE GEOS-2 ELECTRIC FIELD OBSERVATIONS AT TIMES OF SOLAR WIND DISCONTINUITIES
K. Knott, A. Pedersen, and U. Wedeken (Goettingen Univ.) *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 289-291 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24606# Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Inst., Leningrad (USSR).
SOLAR WIND CONTROL OF ELECTRIC FIELDS AND CURRENTS IN THE MAGNETOSPHERE AND IONOSPHERE
O. A. Troshichev *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 407-416 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

N85-24615# Imperial Coll. of Science and Technology, London (England).
SOLAR WIND CONTROL OF MAGNETOSPHERIC CONVECTION
S. W. H. Cowley *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 483-494 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-25163 California Univ., Berkeley.
HIGH RESOLUTION HARD X-RAY SPECTRA OF SOLAR AND COSMIC SOURCES Ph.D. Thesis
Richard Alan Schwartz 1984 115 p
Avail: Univ. Microfilms Order No. DA8427092

High resolution hard X-ray observations of a large solar flare and the Crab Nebula were obtained during balloon flights using an array of cooled germanium planar detectors. In addition, high time resolution high sensitivity measurements were obtained with a 300 sq cm NaI/CsI phoswich scintillator. It is found that the flare impulsive hard X-ray spectrum cannot be produced by thermal bremsstrahlung from a homogeneous Maxwellian electron distribution. Repeated low intensity hard X-ray spikes were observed for an additional 13 minutes indicating that electron acceleration continues well past the impulsive phase. The impulsive hard X-ray flux seems to be of non-thermal origin, it a steep super-hot component of the flare hard X-ray spectrum at energies below 35 keV was discovered. The Crab spectrum from both flights was searched without finding evidence of line emission below 200 keV. In particular, for the 73 keV line previously reported we obtain a 3 upper limit for a narrow (1 keV FWHM) line of 1.9 x 10 cm and 1.4 x 10 cm ph sq sec for the 1979 and 1980 flights, respectively. Dissert. Abstr.

N85-25164 Massachusetts Univ., Amherst.
MORPHOLOGY AND ENERGETICS OF NARROW ANGLE TAIL RADIO SOURCES Ph.D. Thesis
Christopher Peter ODea 1984 469 p
Avail: Univ. Microfilms Order No. DA8500112

Fifty-seven radio sources in the directions of clusters of galaxies were observed with the VLA with resolutions of approximately 1.4'. Thirty-eight Narrow Angle Tail (NAT) sources from these observations were combined with 13 from the literature to produce a representative sample of 51 NATs in the directions of Abell clusters. The global properties of this sample were investigated. Correlations between various parameters (i.e., optical rank, core and total power, width, length, galaxy velocity, distance from the cluster center, cluster richness, Bautx-Morgan type and Rood-Sastry type) were examined and discussed within the context of our current understanding of rich clusters of galaxies. The statistical results are in agreement with the hypothesis that the tailed morphology of these objects is due to the interaction of the radio plasma ejected by the moving galaxy with the intracluster medium. Author

N85-25165*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COSMIC RAY ENVIRONMENT MODEL FOR EARTH ORBIT Final Report
L. Edmonds 15 Jan. 1985 53 p refs
(Contract NAS7-918)
(NASA-CR-175666; JPL-Pub-84-98; NAS 1.26:175666) Avail: NTIS HC A04/MF A01 CSCL 03B

A set of computer codes, which include the effects of the Earth's magnetic field, used to predict the cosmic ray environment (atomic numbers 1 through 28) for a spacecraft in a near-Earth orbit is described. A simple transport analysis is used to approximate the environment at the center of a spherical shield of arbitrary thickness. The final output is in a form (a Heinrich Curve) which has immediate applications for single event upset rate predictions. The codes will culate the time average environment for an arbitrary number (fractional or whole) of circular orbits. The computer codes were run for some selected orbits and the results, which can be useful for quick estimates of single event upset rates, are given. The codes were listed in the language HPL, which is appropriate or a Hewlett Packard 9825B desk top computer. Extensive documentation of the codes is available from COSMIC, except where explanations have been deferred to references where extensive documentation can be found. Some qualitative aspects of the effects of mass and magnetic shielding are also discussed.
Author

N85-24591# Academy of Sciences (USSR), Apatity. Polar Geophysical Inst.
ON THE LOCATION OF THE SOURCE FOR X-RAY MICROBURSTS
A. A. Khrushchinsky, I. A. Kornilov, L. L. Lazutin (Graz Tech. Univ.), and W. Riedler *In* ESA Achievements of the Intern. Magnetospheric Study (IMS) Sep. 1984 p 325-327 refs (For primary document see N85-24544 14-46)
Avail: NTIS HC A99/MF E03

99 GENERAL

N85-25166*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESEARCH AND TECHNOLOGY
1984 92 p
(NASA-TM-86662; A-85045; NAS 1.15:86662) Avail: NTIS HC A05/MF A01 CSCL 05A

Various research and technology activities at Ames Moffett and Ames Dryden are described. Highlights of these accomplishments indicate the Center's varied and highly productive research efforts for 1984. The research is divided into three subject areas, which are: Aeronautics, Life Science and Space Science and Applications.
E.R.

N85-25167# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR): TECHNICAL REPORT SUMMARIES. FOURTH QUARTER (CY) Quarterly Report, Oct. - Dec. 1984
B. J. Wert Jan. 1985 224 p
(AD-A150860; AFOSR-85-0123TR) Avail: NTIS HC A10/MF A01 CSCL 05/2

The Air Force Office of Scientific Research Technical Report Summaries are published quarterly as of March, June, September and December of each calendar year. They consist of a brief summary of each AFOSR technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for that quarter. The summaries contain two indexes for easily locating the technical reports that may be of interest of the user. These are followed by abstracts of the reports. The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting.
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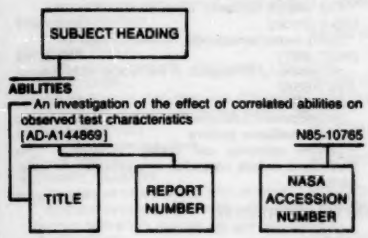

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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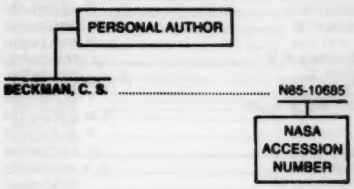

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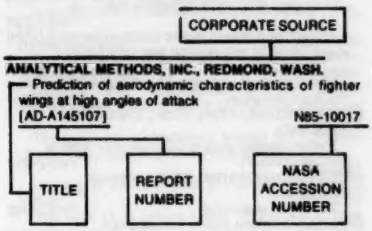

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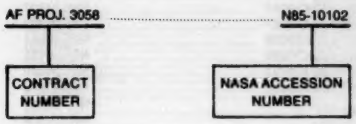

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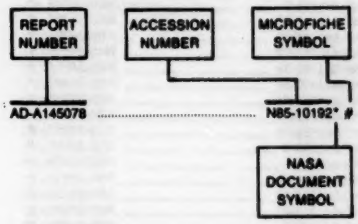

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